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The impact of project governance framework on EPC project success

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Doctor of Management

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Declaration

I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

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作者申明

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Abstract

With the dynamic of worldwide energy demand and the fluctuation of oil price, the investment of offshore oilfield development by the oil majors can change dramatically. These challenges force the fluctuation of the demand of offshore rigs and other facilities chartered by the oil majors for oilfield development. As a result, numerous projects of new building offshore rigs and other facilities are executed around the globe, which are confronting various management and governance factors, causing failure for many of the current and previous projects.

This study, therefore, aims to suggest the project stakeholders in planning and decision-making the project governance way to improve the project success to avoid the similar failure in the future. Through a survey from 258 respondents, data was collected from the practice and academia professionals of the offshore new building projects executed by the project-based firms (PBF) in China, and hypotheses are made among the project characteristics (PC), opportunism (OP), project governance (PG), relation governance (RG) and project success, which project success further divided into project success-efficiency (PSEF) and project success-business development (PSBD).

The hypotheses were proved by employing structural equation modeling (SEM). The findings show that PC, PG and RG have a significant positive impact on PSEF, whereas OP has a negative impact on PSEF. The immortally finding is that the PG positively affects the RG, and the relationship between PG and PSEF is mediated by the RG, this indicates that the combine and alignment of PG and RG will further improve the project success. Moreover, PC have a positive impact on PG and RG, and will determine the extent of opportunism and, whereas the PG and RG will curb the opportunism. Furthermore, PSEF has a positive influence on PSBD, and PSEF was realized to partially mediate the relationship between PC and PSBD. It is expected that the findings present guidelines for the project management professionals so that they endeavor and make better decisions for involving the similar kind's projects as offshore projects in project planning, execution, and other decision making to improve the project success. The concluding remarks also discussed the practical implications, theoretical implications, limitations, and future research directions.

This study developed a project governance framework for EPC projects and built EPC project success model for theoretical research and industrial practitioners to improve the success rate of offshore facilities projects. The proposed model is confirmed to have theoretical explanations for the success or failure of offshore facilities projects.

Keywords: project success, project characteristics, project governance, relation governance, opportunism

JEL: L620, O220

Resumo

Com a dinâmica da procura mundial de energia e a flutuação do preço do petróleo, o investimento no desenvolvimento de campos petrolíferos offshore por parte das principais petrolíferas, pode alterar-se drasticamente. Esses desafios provocam a variação da procura de plataformas offshore e outras instalações suportadas pelas grandes petrolíferas para o desenvolvimento de campos petrolíferos. Como resultado, vários projetos de novas plataformas offshore e outras instalações, são desenvolvidos em todo o mundo, os quais requerem vários fatores diferenciadores de gestão e governação, causando disrupções em muitos dos projetos atuais e anteriores.

Este estudo tem como objetivo sinalizar aos *stakeholders* do projeto, no âmbito do planeamento e na tomada de decisão, a forma de governação do projeto que potencie o sucesso do mesmo, evitando falhas similares futuras. Baseado numa pesquisa, a qual inclui 258 respondentes, foram recolhidos dados da prática empresarial e da academia, relativos a projetos de construção offshore, executados por Empresas Baseadas em Projetos (PBF) na China. Foram enumeradas diversas hipóteses, baseadas nas Características do Projeto (PC), no Oportunismo do Projeto (OP), na Governança de Projeto (PG), na Governação da Relação (RG) e no sucesso do projeto, sendo este dividido em Sucesso-Eficiência do Projeto (PSEF) e Desenvolvimento de Negócios de Sucesso do Projeto (PSBD).

As hipóteses foram validadas através de Modelos Estruturais de Equações (SEM). As evidências mostram que as dimensões PC, PG e RG, têm um impacto positivo estatisticamente significativo no PSEF, enquanto a dimensão OP tem um impacto negativo na dimensão PSEF. A evidência mais significativa é que a dimensão PG afeta positivamente a dimensão RG, e a relação entre PG e PSEF é mediada pela RG, inferindo-se que a combinação e o alinhamento entre PG e RG melhorará ainda mais o sucesso do projeto. Além disso, a dimensão PC tem um impacto positivo na dimensão PG e na dimensão RG, determinando a extensão do oportunismo, enquanto a PG e a RG evidenciam um efeito mitigador. Além disso, o PSEF tem uma influência positiva no PSBD, agindo a dimensão PSEF como parcialmente mediadora da relação entre as dimensões PC e PSBD. Espera-se que os resultados proporcionem orientações relevantes para os profissionais de gestão de projetos, no sentido de um maior esforço e melhor tomada de decisão, extensível a projetos semelhantes aos projetos offshore, no âmbito do planeamento, execução e outras decisões, conducentes à melhoria global do sucesso do projeto. Nas considerações finais foram igualmente evidenciadas as implicações práticas, as implicações teóricas, as limitações e direções de pesquisas futuras.

Este estudo propõe uma estrutura de governação para projetos EPC, bem como um modelo que identifica os fatores de sucesso. De génese académica e profissional, procura melhorar a taxa de sucesso de projetos a desenvolver em offshore. O modelo proposto evidencia um conjunto de fatores que determinam o sucesso ou o fracasso deste tipo de projeto, envolvendo offshore.

Palavras-chave: sucesso do projeto, características do projeto, governação do projeto, governação da relação, oportunismo

JEL: L620, O220

摘要

随着全球能源需求的动态变化和石油价格的波动，石油巨头对海上油田开发的投资随时会发生巨大变化。这些挑战迫使石油巨头为油田开发租用的海上钻井平台和其他设施的需求波动。因此，全球各地许多新建海上钻井平台和其他设施的项目，从而面临着各种管理和治理因素，导致许多当前和以前的项目失败。

因此，本研究旨在建议项目利益相关者在规划和决策中采取项目治理的方式，以提高项目的成功率，避免类似的项目失败将来再次发生。通过对中国海洋工程建造公司的项目经理、项目组成员等专业人员，以及熟悉海洋工程项目的学术界相关人士那里收集数据，共收集到 258 份有效问卷。然后构建了研究模型，基于项目特征（PC）、机会主义（OP）、项目治理（PG）、关系治理（RG）和项目成功等变量提出了相应的假设，其中项目成功变量又分为项目效率成功（PSEF）和项目业务发展成功（PSBD）两个子变量。

随后通过结构方程模型（SEM）验证了这些假设。研究结果表明，项目特征、项目治理和关系治理对项目效率成功有显著的正面影响，而机会主义对项目效率成功有负面影响。最重要的发现是，项目治理对关系治理有积极正向影响，项目治理和项目效率成功之间的关系由关系治理中介调节，这表明项目治理和关系治理的结合将进一步提高项目成功率。此外，项目特征对项目治理和关系治理有积极影响，并将决定机会主义的程度，而项目治理和关系治理将抑制机会主义。此外，项目效率成功对项目业务发展成功有积极的影响，并且项目效率成功对项目特征和项目业务成功之间的关系有部分中介作用。

本研究结果将为项目管理和治理专业人员提供指导，以便他们做出更好的决策，以提高项目成功率。最后还讨论了本文的实践意义、理论意义、局限性和未来的研究方向。

本研究为 EPC 项目建立了项目治理框架，并为理论研究和实践从业者建立了 EPC 项目成功模型，以提高海上钻井平台和其他设施项目的成功率。该模型对海上设施项目的成功或失败提供理论解释。

关键词：项目成功，项目特征，项目治理，关系治理，机会主义

JEL 分类: L620, O220

Acknowledgements

When I was close to completing my doctoral thesis in management, I feel that I am lucky and I enjoy the full journey of the study and thesis writing as well as my work and life, even though I occasionally felt hard along the way. This may be due to my optimism. I always think of the good side of the things. These joys come from the joy of completing work tasks, from the beautiful life accompanied by family members, from the time of solitude and study after work and life, and the joy from the work, life and myself enriched or brought by study. On the completion of this doctoral thesis, there are too many memories, thanks and insights.

When I was a child living in the countryside, our village was not electrified when I was born. The daily lighting needs kerosene lamps. I vaguely remember the impression the date of our village was electrified. Having TV broadcasting facilities are ready and there is a TV at my home when I am at grade 5 and 6 of primary school. At that time, I didn't have any lofty aspirations. I just wanted to go out of the countryside and can afford myself with an occupation in the cities. If I had a small dream then, it came from TV dramas of the Hong Kong lawyers with special clothes and headgear, and they debate with each other in court. This buried me the seeds of a good dream of being a lawyer at that time. However, I studied engineering later and worked in heavy industry after graduation. I once thought that I would be an engineer dealing with metals and wires in my life, and I had no chance to be a lawyer or other legal profession anymore. Fortunately, I am transferred to Shanghai by our working company. During work, I face many legal problems in the process of negotiation with customers, especially foreign customers. And most contracts are applicable to British law. At that time, I learned that Shanghai University had a second degree in law. I didn't hesitate to apply for the examination and was admitted. I saw the dawn of being a lawyer again. During my study, I passed the Chinese judicial examination (Bar Qualification test) at one time. After that I am certified as a maritime arbitrator. All these together rekindled my study and learning enthusiasm. After graduation of a second degree in law, I applied for MBA studies in Tongji University and the University of Manchester in the UK. During the course, I finished lots of English course assignments and small thesis, Chinese thesis, etc. It was very TOUGH. I graduated on time and got master's degree certificates from both Tongji University and the University of Manchester. Master's graduation ignited my dream of continuing a doctoral study. Anyway, I once hesitated whether to continue my study after graduation, also ask myself what I shall choose for PhD study, law, or management. After hesitating for 2-3 years, I still couldn't convince myself not to study for a doctor, because the

dream of studying for a doctor has always been there. To leave no regrets, I still chose to move on. In the wandering of Doctor of Law and Doctor of Management, I chose management.

From beginning the study of Doctor of Management, gone through the course study, propose a thesis and expound its feasibility, mid-term defense and subsequent thesis writing, I am finally close to the completion of the thesis. First, I would like to thank my Portuguese doctoral supervisor Professor Ilídio Tomás Lopes and Chinese doctoral supervisor Professor Chen Guangyu. This thesis is completed under the careful guidance of both of them. In the process of writing the manuscript, coincides with the global outbreak of COVID-19, they took much time in their busy schedule to seize the opportunity to guide my doctoral dissertation through video, or to seize the rare opportunity to meet and exchange ideas face to face. Their profound knowledge, keen insight and rigorous logic have benefited me a lot. By completing the thesis under the guidance from both of them, it has laid a good foundation for my future work and study. Here, I would like to thank them again for their training. In my future work and study, I will work hard to win glory for their training and study guide.

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live a happier life through study and learning. I hope to make an example to realize my dream through my own efforts and struggle. By doing this, make sure that she believes knowledge can change one's life. And let her know that learning is a very happy thing. Let her know that learning is not only to get into a good university and find a good job, but also to improve our mind through learning, cultivate the spirit of optimism, be a person who contributes to society and family, do meaningful things, and be more willing to do what you can to change the world, society, industry, or the academy. Of course, the foundation of all these is that I hope she like sports because the health is the foundation of everything.

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Work is study, study is work, and study and work are also life. Completing this doctoral thesis is not the end of study, but a new beginning. Study and work hard!

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致谢

日月春秋，春秋日月。在我即将 42 周岁时，接近完成管理学博士论文。回顾自己的求学、生活和工作经历，一路走来，虽偶感艰辛，但更多的是快乐，这可能归功于自己的乐观主义精神，凡事都往好的一方面想，时长被亲朋挚友批评为呆萌。这些快乐来自于完成任务时的喜悦，来自于家人陪伴的美好生活，来自于工作生活之余的独处学习时光，更来自于所学用于工作、指导生活、丰富自己所带来的喜悦。值此博士论文完成之际，有太多感慨、感谢和感悟。

小时候生活的农村，我出生时还没有通电，照明需要煤油灯，我隐隐约约记忆通电时的印象。有电视转播设施（因地势原因，看电视需要政府安装专门的电视转播设施）且家里有电视已经是小学五六年级的事情了。当时也没有什么远大志向，只希望能通过读书走出农村，吃“商品粮”，要说有一个小小的梦想，那是看电视剧时其中的香港律师有专门的服装和头套，在法庭上舌战群雄，在当时幼小的心灵里埋下了做个律师挺好的梦想种子。然而，阴差阳错，后面学习了工科，毕业以后也从事工程方面的工作。一度以为，这一生就做一个和金属、电线等打交道的工程师了，无缘律师或其他的法律职业。然而，因为自己工作后的努力，工作过程中转到的工程商务岗位且工作调动到上海，和客户尤其是外国客户谈判过程中面临诸多法律问题，且大部分合同适用的是英国法。恰好当时了解到上海大学有法学二学位课程，毫不犹豫的报考且被录取，再一次看到了可以做律师的曙光，在读期间我一次性通过了司法考试，随后成长为一名兼职法律仲裁员。通过读二学位且通过司法考试，工作也有好几年了，需要总结提升自己，重新点燃了我的学习热情。二学位毕业后报考了同济大学和英国曼彻斯特大学工商管理硕士学习，期间上课，英文课程作业和小论文，中文论文等甚是 TOUGH，所幸遇到了志同道合且非常努力的同学，携手按时毕业，分别取得了同济大学和英国曼彻斯特大学的硕士学位证书。硕士毕业点燃了自己继续读博的梦想，一度犹豫是否要毕业继续读，或者读的话选择法学还是管理学。犹豫了 2-3 年，最终还是说服不了自己不读博士，因为读博士的梦想一直都在，为了不留遗憾，还是选择继续前行。在法学博士和管理学博士徘徊中，选择了管理学。

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工作就是学习，学习就是工作，学习工作也是生活，完成此博士论文不是学习的结束，而是新的开始，努力！

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Acronyms

AVE	Average Variance Extracted
CCG	Chinese Central Government
CFA	Confirmatory Factor Analysis
COB	Chinese Offshore Builders
CC	Project Contractor Characteristics
EPC	Engineering, Procurement and Commissioning
EFA	Exploratory Factor Analysis
EC	Project Environment Characteristics
FX	Flexibility
GOF	Goodness of Fit
IE	Information Exchange
OP	Opportunism
OC	Project Owner Characteristics
PS	Project Success
PBF	Project Based Firms
PC	Project Characteristics
PG	Project Governance
PSEF	Project Success-Efficiency
PSBD	Project Success-Business Development
RG	Relation Governance/Relational Governance
SOE	Stated Owned Enterprise
SOF	Stacked Offshore Facilities
SFL	Standardized Factor Loading
SO	Solidarity
TR	Trust

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Chapter 1: Introduction

1.1 Practical background

1.1.1 China and manufacturing

Official national statistics in China indicate 10,209 PPP projects had been registered from 2014 to Nov 2021, seeking a combined investment of 16.1 trillion RMB (approximately 2.5275 trillion U.S. dollars). According to the China Public Private Partnerships Center, under the Ministry of Finance (MOF), 7,618 of these projects had entered the implementation stage, with a combined investment of 12.7 trillion RMB. Of the total number of registered projects, 4,748 had entered the construction phase, with investments adding up to 7.5 trillion RMB (Economical Daily, 2022) .

Using China as a reference country in the field of project management, this research focuses on the project-based firms (PBFs, such as the senior supplier) that has a profile and is currently actively involved in the development of offshore oil and gas projects in China for the clients of all over the world. In this regard, the opinions of Chinese professionals from PBF companies, and academics from the organizations that regularly work in the Chinese market for the development of such projects, were taken into consideration. To obtain the information related to the different constructs analyzed, we chose to conduct a survey as the primary information collection method. To achieve this goal, a questionnaire was designed and targeted towards a convenient sample of people (Irún et al., 2020).

In today's competitive business environment, manufacturing companies are constantly under pressure to perform well and start to offer custom solutions under one-to-one condition to test the waters, prior venturing into long-term strategy for the transformation. Organizations across diverse sectors such as metal, energy, EPC engineering is seen to be moving in this direction. However, in doing so, they may continue to face stiff challenges such as loss of sales and customer dissatisfactions. In a nutshell, project management serves as a vehicle that fuels the fulfillment of a custom solution as part of operational discipline. Out of which, either custom project life cycle or custom project governance under project management are used by organizations across diverse sectors (Teoh et al., 2021).

1.1.2 Offshore industry

Apart from an uncertain international environment characterized by slowing global growth and increasingly protectionist sentiments in several developed economies, the energy and maritime sector continues to be severely impacted by volatile and depressed oil prices, which fell to a historically low level within recent years. Major oil companies responded by reducing capital expenditure in exploration and production (E&P) activities, thus resulting in the cancellation charter contracts of the offshore rigs, platforms and vessels (Offshore Facilities) with their subcontractors (Offshore Contractors), who normally owns and operates the Offshore Facilities. The Offshore Contractors therefore suffer from the weak utilization of the existing fleet of Offshore Facilities. This means that the Offshore Facilities are oversupplied against the demand.

While the oil price maintained at more than 100 US dollars per barrel, most of the Offshore Contractors placed plenty of new orders (Building Orders) to build the Offshore Facilities with the offshore fabrication entities (Offshore Builders), which normally are located in Asia and normally engage shipbuilding business as well. For each of the new Building Orders, the Offshore Builders normally need engage the material and equipment supplies (Offshore Vendors) to provide valuable items for the Offshore Facilities to be built. The Offshore Builders from Korea, Singapore and China are the key players to have secured most of the new Building Orders during that period. And the majority of the new Building Orders is placed for building the jack-up and semisubmersible drilling rigs.

If these Offshore Facilities under construction were delivered and join the existing fleets of the Offshore Contractors, that will make a continuing oversupply compared with the demand by the offshore market. Thus the Offshore Contractors will not take delivery of the new-built Offshore Facilities from the Offshore Builders and the Offshore Facilities built per the Building Orders shall be stacked with the Offshore Builders.

Here, the industry value chain composed by the oil companies, Offshore Contractors, Offshore Builders, Offshore Vendors and other stakeholders, which add value for supply of the Offshore Facilities, is termed as Offshore Industry.

1.1.3 Offshore new-building industry of China

Shipbuilding and offshore industry are listed as one of the ten priority industry to be encouraged by the central industry ministry from 2006 and afterwards (MIIT, 2015). The Chinese offshore industry develops and grows dramatically between 2006 and 2014. After the oil price drop from 2014, the Chinese Offshore Builders (COB) are facing more serious challenges than the

competitors of Korea and Singapore. The COBs are stacking with a considerable number of Offshore Facilities that they are unlikely to be able to deliver within the contract period per the Building Orders. According to the CODIA and based on the average order price, 200 millions US dollars per jack up drilling rig and 550 million US dollars per semisubmersible drilling rig, the total original order value of the stacked Offshore Facilities (70 jack ups and 10 semi-submersibles) within COBs is as high as 20 billion US dollars (International ship network, 2019). Most of these new Building Orders are owned by speculators or are built on a speculative basis by the clients, who are not pure Offshore Contractors. Especially for the jack up rigs, the majority of these have been ordered in China with high tail-end heavy payment terms (90-99% due on delivery) and no parent guarantee. The jack up rigs are, in general, not being offered in tenders, but have been ordered with the intention to resell the rig prior to delivery (China Ship Inspection, 2017).

And from 2014, the market value of these Offshore Facilities represents only 50%-60% of the original price of Building orders. The clients intend to escape from the contract even though the COBs finished the Offshore Facilities on time per the specification and the contract of the Building Orders (China Ship Inspection, 2017). And re-selling these Offshore Facilities is proving very not applicable. Most COBs face huge pressures, even seriously affecting whether they could be able to survive if no applicable solution found (International ship network, 2020).

The aspect need be highlighted is that, except one private COB with two jack up stacked, almost all of the COBs with plenty of stacked Offshore Facilities are stated owned enterprise (SOE). These COBs are the subsidiaries or joint-ventures of the SOEs governed by the Chinese Central Government (CCG-SOE) (K. Liu, 2013). They engaged the offshore newbuilding business to build Offshore Facilities from 2005 for both aiming at more profit and responding to the initiative industry policies of central and local government. Even the parent company or sister company of some COBs, as the speculation clients of non Offshore Contractors, placed a few new Building Orders with the COBs (S. Wang, 2019).

1.1.4 CA Company

CA company is a a stated owned corporation, which is a subsidiary of a CCG-SOE. Within CA company, there are more than 10 shipyards and 30 specialized companies to provide relevant service or products for maritime industry. Five of the 10 shipyards engaged offshore business to build Offshore Facilities for different kind of clients. From 2015, more than 20 Offshore Facilities are stacked and can not be delivered to the original clients of the Building Orders. As same as other COBs, the clients only paid 5%-20% order price of the Offshore Facilities while

placing the Building Orders. And rest of order price are only due upon delivery of the Offshore Facilities to the clients. CA company need get heavy financing loan from banks to finish the building of the Offshore Facilities.

As same as other COBs, after the oil price collapse, the clients do not want to take delivery of the Offshore Facilities built by CA Company by uplifting the approval standards during drawing review, quality check, sea trial, final test etc, and these kind measures may result in delay on delivery of the Offshore Facilities to trigger the termination clauses in the contract of new Building Orders. In such case, the arbitration may be set up by clients or CA Company if any dispute between the about terminations of the contracts.

Given the current downturn, CA company are thus “stuck” with a considerable amount of Offshroe Facilities (Stacked Offshore Facilities, SOF) that they are unlikely to be able to sell at the current market price, which is lower than the original order price, as the relevant governance factors on the SOEs. Thereafter, CA owns too many debt to bank and becomes more and more difficult to get further finance support for new coming orders. Without new orders, CA will lack earnings to pay back the loaning. All of these issues together may bring systemic problems for CA company. How to resolve such problems currently faced by CA is one of major issues. The problems facing by CA, are also applicable to other COBs.

1.2 Theoretical background

1.2.1 Project success

The new Building Orders are normally negotiated and concluded as a type of engineering, procurement and commissioning (EPC) contract (EPC Contracts) as well as the specifications of the Offshore Facilities based on turkey basis between the Offshore Contractors (Client) and Offshroe Builders (Project-based firms-PBF, as senior supplier). The terms and conditions of EPC Contracts shall specify the function requirements, delivery time, payment terms, the responsibilities of the parties. The delivery time is one of the important terms to specify when the Offshore Facility will be finished by the Offshore Builder. The period from the date of the Building Orders to the scheduled delivery time (Delivery Period) is the time that the Offshore Builder could use to engineer and build the offshore facilities. The Delivery Period could be a few years, normally two to five years (B. Sun, 2007).

During the Delivery Period, the Offshore Builder need engage concept design, basic design, detail design, procurement of materials or equipments, shop design, fabrication and other

serious activities step by step (As illustrated by the Figure 1.1). The Offshore Builders will organize the activities by establishing project team organization and using the best practices of project management to accomplish the building of the Offshore Facilities (or Offshore Project).

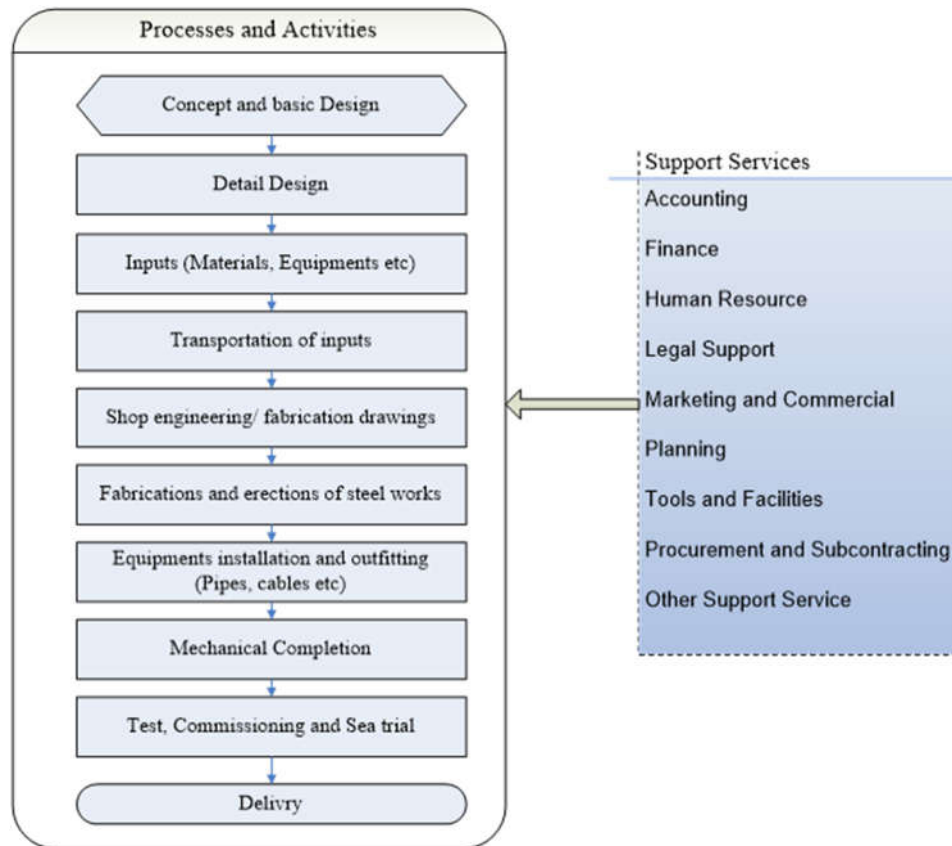


Figure 1.1 Process of shipbuilding/offshore project new building

Even the project success attracted a number of literature study, it is neccessorily to recap the literature gap on how the success of Offshore Project being defined from the perspective of COBs as the PBFs. The difference between success in projects and success in project management need be highlighted. According to Wit (1988) , project success means that the goals and benefits are obtained in a project from the organization level, whereas success in project management determined by the scope, deadline and cost of the project level(Wit, 1988). The same statement is also argued by Cooke-Davies (2002). The success arguing by the COBs, completion of the Offshore Project on time per the specification and ready for delivery, can only be seen as the success of the project management, not the project success. So, project management theory itself is not enough to explain the problem facing by the COB, a more broad view of theory need be explored. We also propose that these eight stakeholders will have different interests in the project's outputs, out-comes, and impacts, and so have different ways of judging project success over different time-scales (R. Turner & Zolin, 2012; J. Wang, 2008).

1.2.2 Project governance

For the definition of project governance, there are wide variations in the literature. This indicates that there is a lack of a mainstream understanding of, and agreement on, what constitutes project governance. Some common themes exist among the definitions, such as project governance being a framework for project decision-making, addressing interests of stakeholders, monitoring and controlling project progress, defining and ensuring successful project delivery, and aligning projects with organizational strategy. However, the definitions do not agree on what actually comprises project governance. Another point of difference between definitions is the scope of project governance in terms of organizational level. The definitions of APM describe project governance as an overall framework that includes the governance of projects, programs, and portfolios (APM, 2004), while PMI limit its scope specifically to project-level activities (X. C. Lu, 2008; PMI, 2016).

Same as project governance is understood and defined by Musawir et al. (2017) numerously depending upon the different background and research discipline of the authors (Bekker, 2015). And several theoretical lenses have been used to explain project governance, which includes agency theory, stakeholder theory, shareholder theory, transaction cost economies (TCE) theory, institutional theory, and others.

Any one of the theories in the literature is not adequate to explain the project governance as its complexity and the difference context. Special attention should be paid to the project governance within the context of SOE as the most COBs are CCGSOE. The most COBs hold the assumption that the previous suffer from the stacked Offshore Facilities are mainly because of market risk. So, CA Company and most of COBs are afraid to take further new Building Orders. Without enough new orders, most COBs will have no earnings to pay back the loaning to bank. Thereafter, the COBs will need go bankrupt, and the debt owned by the bank will become bad debt in theory, but the problem is that bankrupt is a big challenge for the CCG-SOE.

The attention and background drawn from the Chinese offshore industry, the unique company governance structure and industry policy would ultimately influence the context of the project, the influence will consequently pass over to the project governance.

1.3 Research problem and questions

Few theories are found to study the project governance from both the project owner and project

supplier or PBFs perspective. And there is lack of a theory to identify the processes on how both the project governance of project owner and relation governance of project supplier to improve the project success within Chinese context, especially from contractor or subcontractor perspective. Based on the Chinese offshore industry and CA Company as the study background, this field work will explore an in-depth understanding of how the project governance together with relation governance correlates with project success within Chinese context.

More specifically, this research seeks to answer the question of how to improve project success through a consideration of relation governance and project governance. It is accomplished by developing an empirical study model utilizing relation governance and project governance, as well as opportunism as independent variables and project success as the dependent variable. The following research questions in our study will be studied:

RQ1, what are the key components of project characteristic for the success of offshore projects? How do project characteristics affect project success?

RQ2, how do the project governance and relation governance restrain the opportunism present in offshore projects? And how does opportunism impact project success?

RQ3, what is the nature of the relationship between project governance and relation governance? And how does relation governance mediate the relationship between project governance and project success?

RQ4, what are the criteria that are needed for the success of projects from the perspective of project contractors? To what extent is project efficiency correlated with overall project success?

Thereafter in Chapter 2, the relevant literature will be reviewed, and in Chapter 3, we build a theoretical framework for the simultaneous project success concepts at project and firm levels in a PBF. The research methodology design is presented as well. Chapter 4 describes scale development process of project characteristics. Chapter 5 describes the analysis and findings presenting that are chosen for detailed analysis. Chapter 6 is a discussion about the results compared with previous research, and Chapter 7 presents the conclusions and implications of the study (Mutka & Aaltonen, 2013).

1.4 Research method

Our research is based on the analysis of the correlation between the various project factor variables (project characteristics, opportunism, project governance and relational governance) and project success (project-level project efficiency and firm-level project success) by the

different main stakeholders (project client, project-based firm). The data for the analysis was drawn from a survey of offshore projects carried out by PBFs within Chinese offshore industry. Each of the variables was measured using several questionnaire items. In order to simplify the analysis, we first applied factor analysis (principal component analysis) to confirm the existing questionnaire items and reduce the large number of questionnaire items of project characteristics developed by the authors into a small number of factors (Dvir et al., 2003).

Firstly, this research will begin with the literature review aiming to learn about the nature of the project business, project governance for the success of project, and how the project governance and relational governance interact with the project characteristics and opportunism, finally how such interaction transfers the influence on the firm-level project success through project-level project efficiency.

Secondly, a conceptual model and research hypothesis will be developed from the previous literature review. Followed by the research model, we will perform the research instrument by developing research questionnaires for collecting data. In addition, professionals responsible for offshore projects in PBFs of offshore industry as well as academic professionals in China will be selected to engage for enhancing the conceptual model, developing the scale, and the pilot survey.

Thirdly, the research will come to the phase of data collection. The questionnaire will be sent to the professionals of different levels within PBFs in Chinese offshore industry. As well as the clients and vendors of PBFs will be considered as the receipt of the survey questionnaire. The survey will be conducted by web, email, telephone and/or face to face interview.

Fourthly, the data analysis will be followed, and structural equation modeling (SEM) will be conducted. SEM, as a multivariate statistical analysis technique, can measure latent variables, by linking to an unobserved theoretical concept (Hair et al., 2021).

Thereafter, the findings from the data analysis and the hypothesis will be verified. At this stage, the research results will be presented to CA Company for verify. Implications for academy and practice are proposed thereafter. This will contribute to the theory gap of the project success and related governance theory within Chinese context as well as the practices. Moreover, problems that occur with the PBFs on the offshore projects are faced by other Chinese construction company who are securing infrastructure projects overseas by investing on the project or providing a similar heavy tail payment term. A numbers of nu-successful infrastructure projects rapidly changed the public perception of the overseas project engaged by the Chinese construction companies. The research path of our study is as Figure 1.2.

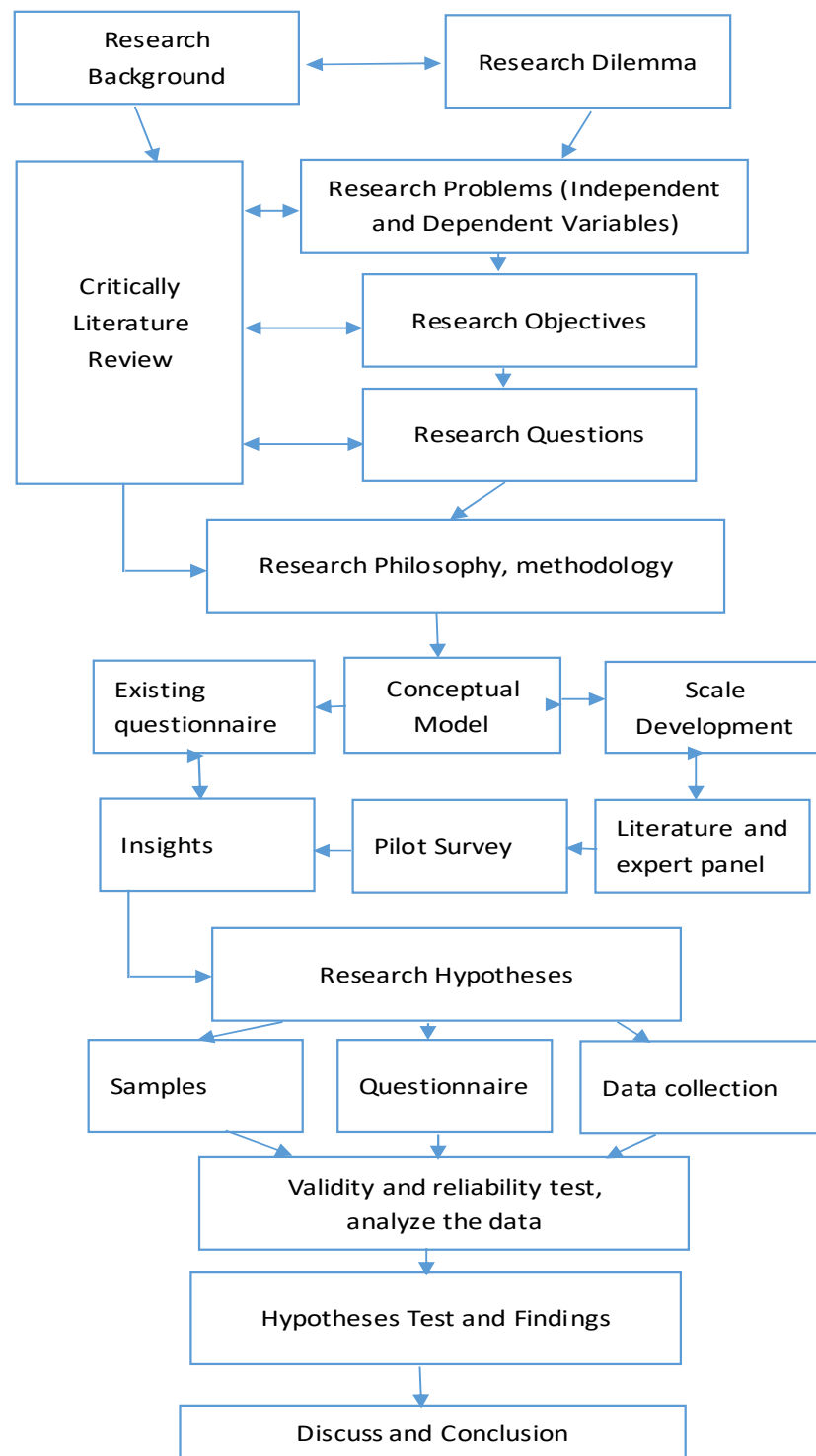


Figure 1.2 Research path

1.5 Research aim

The aim of this study is to challenge and to argue that most project success and project governance is done by from the perspective of project owner or project funding organization.

We will further argue that the project governance with considering only project owners' perspective has limited the development of research in the field. We develop our argument through a critical review of the literature, focusing on project success, project business, project governance, and project characteristics and relational governance framework. First, we will review the literature on project success, showing how it has been defined and what measurement dimensions has created so far. As well as the success criteria and success factors are reviewed. We will then turn to a more recent body of literature of project governance which provides an important, but largely unnoticed, theoretical challenge to the literature on project suppliers—from the perspective of project-based firms and taking the project business and relational effects into consideration. We next turn to an important gap left by these two literatures which has received relatively little attention—the elements gaps of governance framework between the interface of owner and project-based firm, as well as the interface of project-based firm and the project management created by the project. Based on these three reviews, we will develop and present a governance framework for the EPC project by considering the project supplier or project-based firms in the project governance research field.

In this research, relation governance and project governance were studied, both at the organization level and project level; and investigate whether project governance and relation governance interacted each other to enhance project success. First, PBF companies need to design and implement relation governance in order to be in congruence with the specific requirements of project governance. Second, the effectiveness of the alignment between project governance and relation governance can be measured by relating their impacts to the project success respectively. This study uses survey data from offshore industry in China to empirically investigate the relationship between project characteristics/opportunism and project success, as well as their effects on three mediating variables: project governance, relational governance, and project efficiency (Musawir et al., 2017).

To study the impact of project governance and relation governance on project success. Based on the previous research, relation governance has several implications for improving project success and has an impact on opportunism; project governance is also to improve project success. To the best of our knowledge, no one has provided a comprehensive framework that explains how these variables are connected and whether synergizing both kinds of governance (relation governance and project governance) help improve project success or project performance. In this research, we endeavor to provide an empirical model that will help not only academics but also practitioners to explore how project success can be enhanced through the use of relation governance and project governance (Sirisomboonsuk et al., 2018).

The research does not focus on either high-level corporate governance or the lower-level project management and operational details, such as the technical management. The focus falls on governance aspects – like the direction and control functions – at the level of organization-firm-level and its subordinate entire project governance, the project-level.

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Chapter 2: Literature Review

2.1 Project business

2.1.1 Project type

The typology of networks in inter-organizational projects developed by Ahola (2018) proposed three project structures according to the types of relationship(s) between the performing organization(s) and funding organization(s) in the project. These include: Type I – projects led by a single organization, where this entity is not only the funding organization but also the performing organization (Ahola, 2018). These projects may be entirely internal to this single organization. Type II – projects, led by a contracted performing organization (the contractor) and a dyad of a funding organization (colloquially referred to as the client). Type III – projects led by a network of organizations, that include one or more performing organizations and multiple funding organizations, as well as the possible one or more consulting organizations. Whereas the performing organization undertakes the majority or may finish all of project work (PMI, 2016), the peripheral organizations may include suppliers, consultants, subcontractors, or any other partners contracted by the performing organization to provide equipment or systems, and deliver specific supplies or work for the project (Musawir et al., 2020).

The primary governance challenges in Type II projects includes: (i) aligning the interests of consulting organizations and the performing with the funding organizations, also need manage the agency costs incurred to achieve this; (ii) curbing opportunistic behaviors through relational governance as well as contractual governance mechanisms; (iii) clearly communicating the strategic priorities and requirements of the funding organization down to all project participants; and (iv) Establishing reporting and oversight mechanisms to ensure that the availability of relevant project progress information should be ready timely for decision makers (Musawir et al., 2020).

APM (2019) defined two types of projects, fixed-goal projects, and moving-goal projects, from a systems perspective to distinguish between: 1) fixed-goal projects, means the project goal is understood at the beginning and not expected to change significantly during the execution of the project. An example of this could be a piece of infrastructure, such as building a bridge with the purpose of improving traffic flow. 2) moving-goal projects. For the projects that the goal may not be fully understood during the initial phase and/or the goal may emerge

or change. We may only be able to state the ultimate goal in general terms at the outset for these projects (APM, 2019).

2.1.2 Type of organization

Organizations are classified into two types based on the source of projects: Type A organizations undertake projects as their main or even exclusive business, such organization normally supply bespoke products or services to external customers. These firms undertake projects for clients, who do not execute the project by themselves and usually placed their project work in the market. And Type B organizations engage their own projects supporting their mainline business. Projects are mostly internal and undertaken by the support function aiming to deliver new products, new markets, new facilities or developing technologies. Essentially clients of Type A firms are placing their projects in the market, whereas clients of Type B firms are managing their own projects in the hierarchy (J. Turner & Keegan, 2001).

2.1.3 Project-based firms (PBF)/project suppliers

For the Type II projects, owners and operators do not usually undertake the entire projects themselves; they typically hire permanent project suppliers (Type A organization) to provide project-related products or services which are usually organized as project-based firms is Type A organization as mentioned above. The supplier plays a very distinctive role on the project in contrast to that of the owner. For these firms, projects are their core business (Winch, 2014).

Project-based firms (PBFs) organize most of their internal and external activities in projects. Instead of continuous manufacturing or service activities, the business is mostly conducted in temporary project organizations or project team established to complete within the specific goal time (Mutka & Aaltonen, 2013). Today's project-based firms are often involved in several projects of type II or type III simultaneously and must address various multi-projects challenges and trade-offs for example, the allocation and prioritization of resources and ensuring that the members of project organization or project team do not act against the interest of the PBFs (Ahola et al., 2014).

2.1.4 Project business and creating value

Another body of study or research focusing on project-based firms is “project business” and its different kinds of business models. The project business covers firms in many of the sectors as the work on complex product systems and shares its definition of the project-based firm as a

supplier to owners and operators in sectors such as infrastructure construction, telecom industry, shipping and resource extraction (Winch, 2014).

As part of the global business environment, project-based firms that deliver complex systems sometimes utilize other firms as subcontractors or sub-suppliers to provide or offer products and services to their clients and target customers (Momeni & Martinsuo, 2019). Project-based firms require various business relationships in the rapid changing project business environment and need to co-operate with various actors from different geography and countries in project delivery and between projects (Momeni & Martinsuo, 2019).

Artto and Wikström (2005) defines project business and employs a bibliometric study for considering the relevant characteristics of this concept. The analysis results in seven findings that explore project business and indicate that there is a need for several theoretical foundations: organization theory, innovation theories, sociological and psychometric theories. The analysis results in a definition of project business and the unit of analysis are a firm rather than a project. The firm and its business are in a focal role, whereas projects may be secondary.

Finally, based on the findings and reasoning above, project business is defined by Artto and Wikström (2005) in the following way: “Project business is the part of business that relates directly or indirectly to projects, with a purpose to achieve objectives of a firm or several firms” (Artto & Wikström, 2005).

Projects exist within a larger system, such as an organization, governmental agency, or contractual arrangement. Organizations create value for stakeholders. Examples of ways that projects produce value include, 1) Creating positive environmental or social contributions; 2) Creating a new service, product, or result that meets the needs of end users or customers 3) Enabling the changes to facilitate organizational transition to its desired future state; 4) Improving efficiency, effectiveness, productivity, or responsiveness; and 5) Sustaining benefits enabled by previous projects, programs, or business operations (PMI, 2021).

2.1.5 Elements of a project

Conceptually, according to APM (2019), a project should be divided into three elements: Project delivery, Project implementation, Project results (outcomes and benefits).

“Project delivery is focused on delivering the outputs of the project. These outputs could be a piece of infrastructure, a software application, or a piece of military equipment. They are the tangible things that the project team will create and deliver” (APM, 2019).

“Project implementation is all about how the project changes what people are doing or how

they do it. This will involve people using the new infrastructure, application or equipment efficiently and effectively to deliver products and services and/or how people (including wider society) change the way they behave” (APM, 2019).

“Project results refer to the outcomes and benefits achieved. Here we use the word outcomes to refer to all the changes that occur as a result of a project (including both the positive and the negative), while the benefits are the results (financial or non-financial) less the cost of delivering them” (APM, 2019).

2.1.6 Project efficiency and effectiveness

Efficiency and effectiveness are important concepts used in operations, but they are important for projects too. Here we refer to APM (2019) as well:

“Project efficiency is as delivering to the iron triangle, the scope within time and costs” (APM, 2019).

“Project effectiveness refers to whether the project delivers the planned desired outcomes and benefits.” (APM, 2019).

It should be noted that there are multiple stakeholders who usually have quite different perspectives on the benefits and outcomes for many complex projects. This makes that the determination of effectiveness much more difficult to quantify than efficiency (APM, 2019).

2.1.7 Business model

A business model conceptualizes the ways in which a firm creates and captures value. It comprises the organizational architecture, the strategic choices, and the economics of the firm. In a PBF, business models can be found on both the level of the firm and the level of the project (Mutka & Aaltonen, 2013). Focusing on the definition of the concept, scholars seek to study how business models can be classified and represented and define what elements constitute a business model. The business model framework, as a study topic, also defines what elements a business model contains (Mutka & Aaltonen, 2013).

Eight elements are concluded for the business model framework: (1) customer (2) offering, (3) value proposition, (4) resources and capabilities, (5) revenue creation logic, (6) internal organization and activities, (7) competitive strategy and (8) partner network. The four elements offering, internal organization and activities, resources and capabilities, revenue creation logic, are internal to the company and the other four of them, value proposition, customer, competitive strategy, partner network, are external (Mutka & Aaltonen, 2013).

Mutka and Aaltonen (2013) also studied the impact of project-level business models in a PBF. Their findings support the traditional view that firm-level business models dictate project-level business models. They also found that one project-level business model was autonomously emerging from outside the boundaries of the firm-level business models. And the project can introduce a new business model, which could have a bottom-up effect on the firm-level business model by shaping the existing ones or creating completely new ways of doing business through autonomous project-level business models. To conclude, although project-level business models are normally derived from the firm-level business models, autonomous project-level business models emerge that can definitely shape the way a firm does business. The understanding of this logic and dynamics of a PBF is that a project-based firm's business models do not only form intentionally top-down, but also project-level business models' have bottom -up impact on the firm business models (Mutka & Aaltonen, 2013).

2.1.8 Commercial management

A review done by the UK Office of Government Commerce (OGC) found that commercial skills were generally weak for the projects which review covered, and the feedback provided by commercial directors and private sector companies underlined these skills deficits. The biggest gaps are in contract management, the commissioning and management of advisers, risk identification and management, and business acumen (National Audit Office [NAO], 2009).

So, National Audit Office (NAO) developed the Commercial skill sets, which includes: 1) contract management: the successful delivery of long-term projects depends heavily on effective. 2) Contract management: Commissioning and management of advisers: the commercial experience of external consultants can often add considerable value to projects. 3) Commercial risk identification and management: the ability to identify, understand, transfer and manage commercial risk, it is crucial to achieving value for money and the timely delivery of a project. 4) Business acumen: business acumen is the ability to take sound commercial decisions (NAO, 2009).

From a project organizing perspective, the project-based firm is the holder of the resources required by the project team or temporary project organization to deliver the assets desired by the project owner and operator. Although there has been important work in understanding the nature and evolution of project management as well as the project business engaged by the project-based firm, further work is required on how it deploys its project governance and balances them across projects. This suggests that a rather different concept of project portfolio is required from that discussed above for owners and operators. For the project-based firm it is

essentially governance. Further work is also required on the PBF's dynamic capabilities in terms of how they seize new opportunities while maintaining the existing resource base, which is also termed as "dynamic capability" (Winch, 2014). There is a need to maintain a constant dialogue between their clients and project teams, and hence it is necessary to maintain hybrid governance mechanisms (J. Turner & Keegan, 2001).

2.2 Project success

2.2.1 Definitions of project success and business success

As one of the most researched topics in project management, project success has been discussed from different aspect in the literature (C. D. P. Martens et al., 2018). Project success should be linked to the goals and benefits of its organization, dealing with the objectives, effectiveness and benefits that are provided by the project. But, the meaning of the term "success" varies substantially (Joslin & Müller, 2015).

A main issue in the literatures is the difference between project management success and project success. Project success is measured against the overall objectives of the project (Costantino et al., 2015). And project management success normally is measured by time, cost and quality. Rather than project management success criteria, successful projects are more likely to emphasize project success criteria (Thomas & Fernández, 2008).

The concept of long-term project success had been proposed also and it is linked with achieving the benefits of the organization. Unlike short term success, this new concept — considers achieving the overall business strategy, taking means of the portfolio as a measurement of its effectiveness (Petro & Gardiner, 2015). Financial criteria alone are insufficient for a sustainable view of success. Multi-dimensional project-, portfolio-, and company-level concepts have been developed (Voss & Kock, 2013). And more literature focus on portfolio, program, and project success in order for organizations to realize their strategic goals (PMI, 2016).

Most organizations traditionally follow merely financial measures to evaluate and assess their business success. But as many studies have shown these measures alone are insufficient indicators for a firm's long-term success. Shenhar et al. (2001) claimed that the first two success dimensions, namely project efficiency and impact on the customer, cover the project execution phase by the average single project success dimension. The other two dimension "business success" and "preparing for the future" deal with the long-term implications based on the

project results and consequently examine short-term economic effects and (Shenhar et al., 2001, as cited in Meskendahl, 2010).

2.2.2 Dimensions of project success

In terms of measuring success, a variety of models with different dimensions based on different underlying assumptions for measuring project success were developed (Joslin & Müller, 2016). The relevant literatures had been reviewed and the dimensions or elements of the project success be claimed by the authors from different aspects and perspectives are summarized as Table 2.1.

Table 2.1 Dimensions of project success

No.	Dimensions	Quoted From
1	project management success.	(Cooke-Davies, 2002)
2	Project success	
2	product, process, and organizational success	(McLeod et al., 2012, as cited in Badewi, 2016)
3	long term project success to achieving the benefits of the organization	(Cooke-Davies, 2010, as cited in Petro and Gardiner, 2015)
4	increasing focus on portfolio, program, and project success for organizations to realize their strategic goals	(PMI, 2016)
5	Multi-dimensional project-, portfolio-, and company-level concepts has been developed	(Voss and Kock, 2013).
6	The model of measuring success contains the three criteria, which are typically termed the iron triangle, plus four additional project success criteria dimensions: Project efficiency, Organizational benefits, Project impact, Stakeholder satisfaction, and Future potential.	(Khan et al. ,2013, as cited in Joslin and Müller, 2016)
7	four levels of success: project management success; the business efficiency; the overall effectiveness of the project; projecting future gains	(Ruhe & Wohlin, 2014)
8	'Triple-test performance framework: Project management success (PSMS); Project ownership success (PSOS); Project investment success (PSIS)	(Zwikaël & Smyrk, 2015)
9	five dimensions (project efficiency, organizational benefits, project impact, stakeholder satisfaction, and future potential)	(Khan et al. 2013, as cited in Joslin and Müller, 2015)
10	The criteria to define success into three categories: project management success, technical success, and business success,	(Thomas and Fernández, 2008)
11	The success criteria of organizational event projects included four attributes: meeting a project's primary aims, meeting a project's specified aims, the satisfaction of contractors and sponsors and the satisfaction of local and national stakeholders	(Cserháti & Szabó, 2014)
12	The four dimensions of project success: Project efficiency; impact on the customer; business and direct success; preparing for the future.	(Shenhar et al., 2007, as cited in Al-Tmeemy et al., 2011)
13	The success criteria of organizational event projects included four attributes: meeting a project's specified aims, meeting a	(Cserháti & Szabó, 2014)

	project's primary aims, the satisfaction of national and local stakeholders, the satisfaction of sponsors and contractors.	
14	Project success components: Project management success; Product success.	(Baccarini, 1999, as cited in Al-Tmeemy et al., 2011)
15	success framework included efficiency of execution, technical performance, managerial and organizational implications, manufacturability, personal growth, and business performance.	(Freeman and Beale's 1992, as cited in Joslin and Müller, 2015)
16	model that consisted of two constructs; Project success; Product success	(Blindenbach-Driessen, 2006, as cited in Al-Tmeemy et al., 2011)
17	success framework covering organizational effectiveness, technical validity, and organizational validity	(Pinto and Slevin, 1988, as cited in Joslin and Müller, 2015)

2.2.3 Four levels of project success

Project Success needs to be understood at multiple levels to appreciate the complex dynamics and subtle impacts. A tabular representation of four levels of success (Table 2.2) is offered by Dalcher (2014), which builds on the earlier discussion.

Table 2.2 Levels of success

Levels of project success	Focus
Level 1: Project management success	– Efficiency and performance
Level 2: Project success	– Objectives, benefits, stakeholders
Level 3: Business success	– Value creation and delivery
Level 4: Future potential	– New markets, skills, opportunities

Source: Dalcher (2014)

Level 1 represents project management success and is thus concerned performance measurement at the project level through the tracking of the cost, schedule, and performance parameters.

Level 2, through the lens of what is being delivered, are focused on the overall effectiveness of the project. Success is measured through the output that has been delivered. The achievement of the objectives and the benefits of the projects are thus assessed in terms of the satisfaction of the end users, clients or customer and the different stakeholder groups.

Level 3, assessed through the creation and delivery of internal value, is centered on the business efficiency. Through the satisfaction of business objectives that have been realized, the project outcome contributes to business success is verified.

Level 4, by projecting future gains and opening new capabilities, avenues, skills, and markets, is forward looking and opportunistic and enhances the business horizon. Strategic opportunities require a continuous and long-term approach by not aiming just immediate benefit but also maximizing opportunities for cornering the market. Level 4 success is achieved through the realization of new opportunities and harnessing of new potential.

The focus identified in Table 2.2 provides a clue as to the nature of project success measurements required at each level. Measurement at Level 1 focuses on determining the progress and efficiency of the project management. Measures for Level 2 are concerned with benefits realization and measuring the achievements of projects. Measures for Level 3 emphasize the business value using sales, revenue, and delivered value of traditional economic measures. Measures for Level are by creative measurement of capabilities, opportunities, and market position. The combined levels offer an overall picture of conceptualizing surrounding success in and around projects (Dalcher, 2014).

2.2.4 Project efficiency and project success

Cooke-Davies (2002) defined project success terminology and differentiated between project management success (mostly measured against cost, time, and quality) and project success (measured against the overall objectives) (Cooke-Davies, 2002). Serrador and Rodney Turner (2014) adopted more current terminology, which uses project efficiency instead of project management success, and defined project success terminology into two subs: Project efficiency – meeting cost, time, and scope goals; project success– meeting wider business and enterprise goals. This study will adopt this definition about project success. And this definition will be adopted for project success in this study (Serrador & Turner, 2014).

2.2.5 Forecasting project success

As discussed, project success can only be fully evaluated by the stakeholders from different level and different perspective of stakeholders. It is also need be evaluated in the months and years following completion of the project. However, the project team must make judgments during project execution about whether the project will be successful. However, to truly forecast whether the project will be successful, they need to be able to know what the success evaluation criteria are and predict how the various stakeholders will judge success following the completion of the project, and so they need control parameters (leading performance indicators) that will help them to make that judgment (R. Turner & Zolin, 2012).

2.3 Project governance

Project governance, as a subfield of project management, has been gaining more and more attention from the last decades and it is still the main study domain of project management

(Brunet, 2019). Various researchers and practitioners suggested that one reason for poor project success or performance was the lack of effective project governance (Sirisomboonsuk et al., 2018). The relationship between governance, especially project governance, and project performance or project success has recently caught the attention of researchers (Müller et al., 2017). Several countries have been adopting governance frameworks in the past decade to improve projects performance and project success (Brunet, 2019).

2.3.1 Two streams of literature related to project governance

Ahola et al. (2014) claimed that there are two streams among the literatures of project governance, first, the transaction cost economics (TCE) literature, focuses on the selection of the most efficient form of governance mainly drawing from the economics literature, organization theory, and contract law. Second, the corporate governance literature, has focused on the exchange relationship between the corporate owner(s) and the agent (typically CEO and top management team) employed, drawing from, for example, agency theory (Ahola et al., 2014).

The governance mechanisms of PBFs that are mainly reported in the existing and recent literature can be divided into two categories: relational governance and contractual governance. The first mechanism of governance is relational governance, which is an informal type of governance, among the parties involved in a respective transaction, focuses on building friendly relationships among these parties. Contractual governance is another governance mechanism, primarily focusing on highlighting the importance of agreements and written contracts and following formal rules pertaining to the transactions between the parties. The importance of the role of relational and contractual governances in the performance of a project cannot be denied. They are significant in terms of triggering collaborative efforts to align project processes, ensure project success and project business performance, and enhance value for all stakeholders of the projects (Haq et al., 2019).

2.3.2 Definitions of project governance

There are wide variations in how project governance is defined in the literature, but there is a lack of agreement on, a mainstream understanding of it and what constitutes project governance. A list of the key definitions of project governance is provided in Table A.1 of Annex A. Some common themes exist among the definitions, such as project governance being a framework for project decision-making, addressing interests of stakeholders, monitoring, and controlling

project progress, defining, and ensuring successful project delivery, and aligning projects with organizational strategy (Bekker & Steyn, 2007; L. Liu & Yetton, 2007; Sirisomboonsuk et al., 2018; J. Turner & Keegan, 1999). However, the definitions do not agree on what actually comprises project governance (Musawir et al., 2020).

Governance and assurance are very closely related, especially if you consider governance as a key element in project delivery. Therefore, the assurance system needs to be designed with the governance system and as an integral part of governance, not something that is added on after the governance system has been developed (APM, 2019).

Project governance mostly is understood and defined, depending upon the research fields and technical background of the authors. As evidenced by the literatures mentioned above. project governance is defined as “the value system, responsibilities, processes and policies that guide projects to make the organizational objectives achieved and implemented in the best interest of all stakeholders, external and internal, as well as the corporation or the organization itself” (Muller, 2017). Project governance is defined simply as “the framework within which project decisions are made” (Garland, 2009). Project governance is also defined as “the use of systems, structures of authority, and processes to allocate resources and coordinate or control activity in a project” (Pinto, 2014). Strategic alignment is also included in the definition of project governance in PMI's practice guide for the governance of portfolios, programs, and projects: “the framework, functions, and processes that guide project management activities in order to create a unique product, service, or result to meet organizational strategic and operational goals” (PMI, 2016). Similarly, the Association for Project Management (APM) advocates strategic alignment as an important principle of good governance (APM, 2019).

The latest PMBOK of PMI indicates that alongside the value delivery system, the governance system works to enable manage issues, smooth workflows, and support decision making. Governance systems provide a framework with processes and functions that guide activities. A governance framework can include elements of oversight, value assessment, control, decision-making capabilities, and integration among components. Governance systems provide an integrated structure for evaluating issues, changes, and risks associated with the environment and any component in the value delivery system. Project governance, is aligned with program and/or organizational governance, includes defining the authority to approve changes as well as make other project related business decisions (PMI, 2021). In line with the above, this paper adopts the strategy oriented view of project governance (Musawir et al., 2017).

2.3.3 Governance and project phase

Project governance is defined as “a concern of the areas in corporate governance that are particularly related to project activities”. And project governance is divided by APM (2004) into four dimensions, which includes: 1) project management-effectiveness and efficiency, 2) portfolio direction-effectiveness and efficiency, 3) project sponsorship-effectiveness and efficiency, and 4) disclosure and reporting- effectiveness and efficiency. In 2011, APM renamed the third dimension as project management capability from project management effectiveness and efficiency (Sirisomboonsuk et al., 2018). One of the conclusions from APM’s review of the literature and expert panel discussions was that one size doesn’t fit all. Here they make recommendations for governance and assurance (Table 2.3), taking into account the type of project and phase in the project life cycle (APM, 2019).

Table 2.3 Outline structure of recommendations

type of project	Initial phase Concept to business case approval	Delivery phase Business case to operate	Operate phase
Fixed target	Focus on detailed planning, risks, uncertainties, and clarity of end goals	Focus on the balance between project delivery, project implementation and project results	Evaluate the project in terms of both efficiency of delivery and effectiveness in achieving outcomes and benefits
Moving target	Focus on the broader business plan, uncertainties, unknowns, possible project journeys (including indicators of unacceptable risk creep) and desired end-state goal	Focus on the evolution of project delivery, project implementation and project results Ensure that the current aim point and current risks are reviewed regularly and tested against the unacceptable risks developed in the initial phase	Evaluate the project in terms of effectiveness in achieving outcomes and benefits

Source: APM (2019)

2.3.4 Dimensions of project governance

There are various governance literatures (Table A.2 of Annex A) to focus on different aspects of governance that may represent dimensions of project governance, such as portfolio governance, benefits governance. Other forms, such as relational governance, contractual governance, and IT governance, seem to be related to projects involving collaborations among multiple organizations. Yet other forms of governance, such as PPP governance as well as public governance within their specific contexts, are frameworks with specialized guidelines for project governance, that being public sector and IT projects respectively (P. Lu et al., 2015;

Mossalam & Arafa, 2019; Riis et al., 2019).

There is a need to situate and integrate the various forms of project governance literature into a coherent framework. Hence, we propose that the various governance forms represent different facets as illustrated in Table A.2 of Annex A should be refreshed to establish an integral part of the overall project governance system. Accordingly, further research is needed to link the ‘islands’ of literature pertaining to the governance forms. The primary challenge, of course, is first delineating the mainland of project governance itself (Musawir et al., 2020).

2.3.5 The governance gap between project governance and project management

Biesenthal and Wilden (2014) have suggested, project governance is a ‘higher-level structure’ to define processes and structures to govern multiple projects, whereas project management is mainly concerned with operation control and execution of the project work (Brunet, 2019). Project governance aims at bridging or linking the different levels (as Figure 2.1 and Figure 2.2)

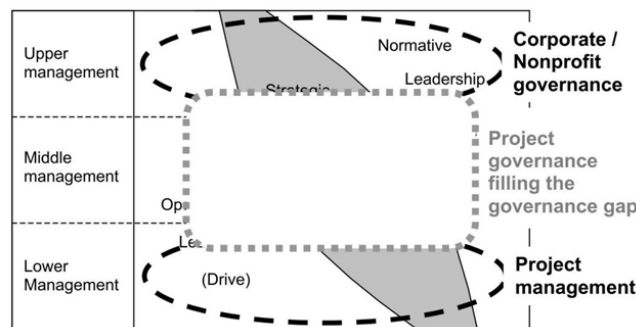


Figure 2.1 Project Governance-Governance Gap

Source: Renz (2007)

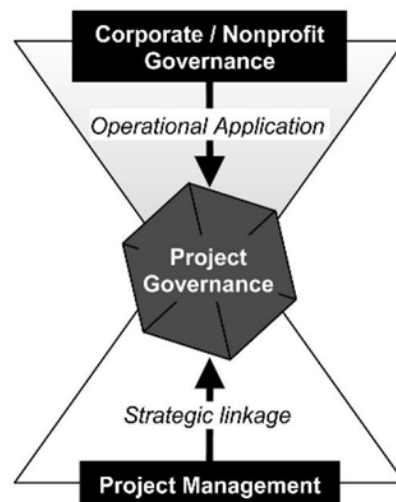


Figure 2.2 Project Governance

Source: Renz (2007)

That there is a need for research illuminating the differences and interplay between different management levels of upper one and lower one, this is called a governance gap. The gap exists mainly in governance-prevalent roles, i.e., the strategic and normative functions. It is clear that there should be a search for bridging this governance gap and some type of middle governance is needed, such as a project governance in the case of project-intense environments, and, joint-venture governance in the case of the company's subsidiaries (Renz, 2007).

2.3.6 Gap of project governance research

Project governance is widely recognized to be among the most critical factors for benefits realization and successful project delivery. However, despite past efforts by researchers in the field, the literature on project governance is fragmented; there is yet a lack of consensus on the fundamental elements it constitutes and what project governance is. To this end, PMI (2016)'s conceptualization of project governance may serve as an important starting point (Musawir et al., 2020).

Biesenthal and Wilden (2014) highlight three particularly areas of previous research interest: (i) the principal agency relationship between client and contractor, (ii) transaction costs associated with projects; and (iii) general mechanisms of governance of projects. Much previous research applied either TCE concepts or agency theory to investigate “the choice of project contracts, the overall and contractual aspects and the forms of bilateral or trilateral or multi-party governance to handle large-scale projects” (Biesenthal & Wilden, 2014).

At the intersection of portfolio, programs and projects management levels, project governance is a multi-level phenomenon, which aids the successful achievement of organizational and project objectives (Müller, 2009). Stressing the effects of effective project governance, project governance contributes to a firm's performance as it helps to improve transparency between different organizational levels (in order to meet project objectives), as well as manage and minimize project risk, and positively influences the information exchange across different stakeholder group (Müller, 2009).

Among the current literature, the main empirical context of project governance is construction. To enhance our understanding of project governance, additional research contexts are needed to progress project governance research; it would be particularly interesting to include contexts in which projects are more agile, more transient, and complex. A focus on offshore industry companies, particularly in the area of offshore EPC new-building projects in China, will certainly help to further validate the concept of project governance, as project governance is always subject to context-specific requirements (Biesenthal & Wilden, 2014).

Also, how effective are these governance mechanisms in improving the performance of an offshore project in the presence of opportunism? Usually, opportunism involves many subtle and complex forms of tricks, such as breaches of promise, bluffing, misleading stakeholders, misappropriation, and theft. Subsequently, parties' opportunistic behavior may mostly lead to poor project performance. Previous researchers focused solely on some specific area or industry, such as construction projects. Existing literature has elaborated on the role of both contractual and relational governance in enhancing project success and project business performance and restraining opportunism. Yet the area remains incomplete, because the previous research has not focused on the influence of project governance mechanisms on project success or project performance in the presence of relation governance of project supplier or project contractor. Relation governance should be the dominating factor in the list of the success factors in cross-organizational offshore projects (Haq et al., 2019).

Furthermore, the problem of whether project governance should be liable to pursue the goals of all stakeholders simultaneously or the funding organization solely, need to be explored for the theoretical and practical justifications (Müller & Lecoivre, 2014). Subsequently, a major challenge in this regard is that projects are inherently temporary and unique undertakings, there is a need to develop a mainstream model of project governance, which means that the optimal governance arrangements may vary from one project to another (Musawir et al., 2020).

In the project governance literature, there are various governance-related terminologies discussed with no clear links between them, and there is not a mainstream conceptualization of project governance. In the literature forms of governance seem to be different aspects of governance that may represent dimensions of project governance, such as portfolio governance, program governance, risk governance, knowledge governance, and benefits governance. Other forms, being related to projects involving a nexus of collaborations between multiple organizations, include relational governance, contractual governance, and network governance. Yet other forms of governance, such as public governance, PPP governance, IT governance and other ones related to infrastructure project governance are frameworks with specialized guidelines within their specific contexts. There is a need of a coherent framework to situate and integrate the various forms discussed in the project governance literature into one framework (Musawir et al., 2020).

2.3.7 Project governance and project success

Project success rates still do not meet expectation even though forty years of research have brought up a variety of new success factors. Because of that, researchers have started to widen

the scope of possible success factors to include project governance as one of the success factors, which has grown exponentially in popularity (Joslin & Müller, 2016). As the key to establishing a successful project, good governance got many testimonies. One that is particularly powerful is the eight principles for project success by Infrastructure and Projects Authority (IPA) of UK. These eight principles include: “1) plan realistically; 2) focus on outcomes; 3) prioritize people and behavior; 4) manage complexity and risk; 5) tell it like it is; 6) be an intelligent client; 7) control scope; and 8) Learn from experience” (IPA, 2020).

And the OGC (2005) identified eight common causes of project failure: “1) Evaluating the proposals mainly from the initial price perspective, not being based on long-term objectives (especially securing delivery of business benefits); 2) Senior management leadership is not enough as well as ownership; 3) Lack of project stakeholders engagement; 4) Lack of linking the project objective with the organization’s key strategic priorities, as well as lack of the agreed measures of project success in advance, especially at the beginning of the project; 5) the work break structure of project not detail enough into manageable steps for implementation and tracing; 6) Lack of skills of project management, and not enough risk management activities; 7) Lack of effective project team integration between clients, the supplier team and the supply chain. 8) Lack of understanding of, and contact with the supply industry at senior levels in the organization” (OGC, 2005).

Project success or performance in terms of time, cost, and quality is a fundamental aspect of how we understand success in projects, commonly known as “The Iron Triangle”. Some researchers claimed that “The Iron Triangle” concept is not enough to define project success, due to it does not take fulfillment of the project's purpose about bringing value into account. However, most project managers in the Chinese offshore industry have an operational focus pressure, and their success criteria as well as mindset are focused on “getting the job done”. While other success criteria have emerged, such as business success, industries sustainable development, environmental impact, societal value, still put heavy emphasis on finishing projects to specifications, on time, within budget, implicitly implying that this is the first step towards fulfilling the other success criteria (Nevstad et al., 2021).

As illustrated in Figure 2.3, while implementing governance, it should involve the least number of resources, authority structure, and processes as possible, because costs and time are associated with governance oversight activities and decision making. Governance processes should be tailored to the portfolio, program and project characteristics or complexity, risks, and other factors (PMI, 2016).

Functions Domains	Oversight	Control	Integration	Decision Making
OPM Governance Alignment Domain	- Perform organizational strategic alignment - Establish governing body - Create OPM governance charter - Conduct periodic planning for prioritization and funding	Create OPM governance management plan	- Align portfolio, program, and project execution with organizational strategy - Integrate portfolio, program, and project processes - Create integrated portfolio, program, and project roadmap	- Establish OPM decision-making process - Determine portfolio, program, and project component prioritization and funding
OPM Governance Risk Domain	Manage portfolio, program, and/or project internal or external dependencies	- Create OPM risk management plan - Establish OPM risk escalation process	Integrate dependency management	Resolve and remediate escalated risks and/or issues
OPM Governance Performance Domain	Conduct portfolio, program, and project reviews and audits	- Create OPM performance management plan - Establish OPM reporting and control processes - Monitor KPIs	- Perform integrated performance reporting - Align resource capacity and capability needs across portfolios, programs, and projects	- Optimize portfolio, program, and project resources - Assess changes to organizational strategy or portfolio, program, and project performance
OPM Governance Communications Domain	Communicate key messages to organization	- Create communications management plan - Monitor communication effectiveness	Disseminate communications	Report decisions made with justification

Figure 2.3 OPM Governance Domains, Functions, and Processes

Source: PMI (2016)

From the analysis of case studies, NAO (2006) identified three key and recurring themes in successful programs and projects (Figure 2.4):

1) ensuring senior level engagement, the concerned senior level of decision makers engaged within the organizations.

2) acting as an intelligent client, making sure to understand what they needed to do as an “intelligent client”; and

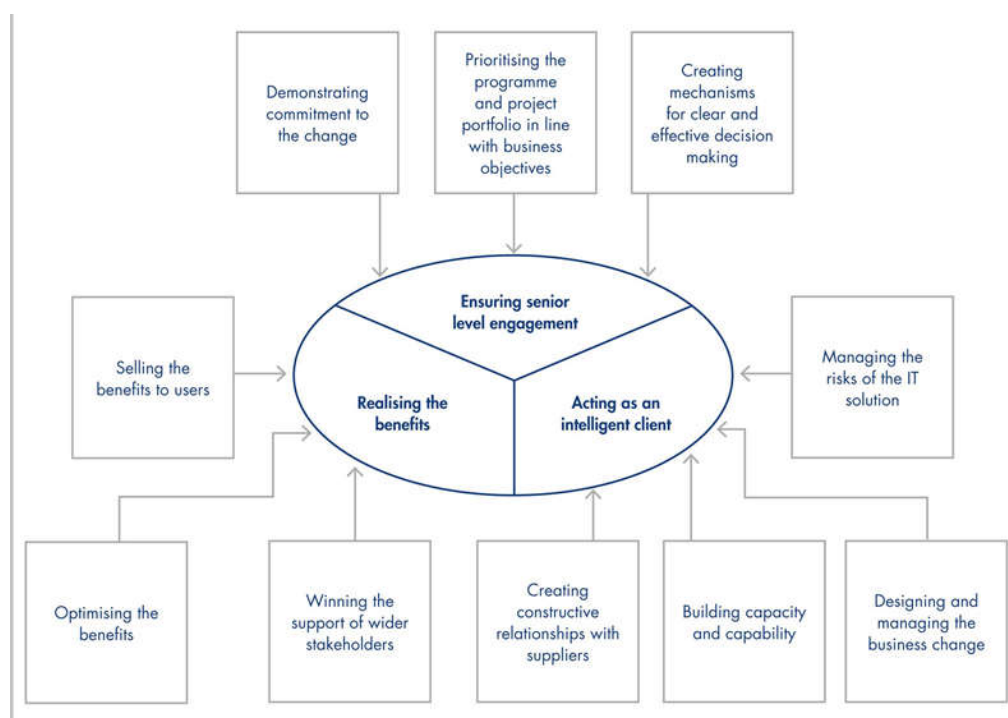


Figure 2.4 Core principles and activities that contributed to success

Source: NAO (2006)

3) realizing the benefits of change, their understanding the outset what benefits they were

aiming to achieve and, importantly, how these benefits could be actively managed to ensure being optimized. It is concluded that whether they were in the public or private sector, the three core principles common to all regardless of type of change, the size, or complexity they were undertaking (NAO, 2006).

Under these three principles, ten key activities are developed and suggested to guide the behavior of the organizations.

Firstly, senior level engagement is crucial for successful delivery in three ways: by creating a clear decision making structure with accountability in order to make the right decisions swiftly and in line with business strategy; by providing mechanisms to prioritize the project portfolio in line with business objectives; and by demonstrating that the senior management is committed to the project (NAO, 2006).

Secondly, acting as an intelligent client should succeed in major portfolios and projects, organizations need the knowledge and skills which include an in-depth understanding of the business process, forming productive, and value-for-money relationships with suppliers, clear understanding of the additional resources and skills for supplement existing capabilities, and the level of technical challenge involved and how to meet it (NAO, 2006).

Thirdly, benefits realization is an ongoing process that begins at the earliest stage of any portfolio or project. Organizations must understand what they are trying to achieve and the benefits and the costs of achieving it and put in place measures to determine that the benefits have been realized. Successful portfolio and projects: won the support of wider stakeholders; sold the benefits to users; and continued to optimize the benefits after completion of the portfolio or project (NAO, 2006).

2.4 Relational governance

2.4.1 Definition of relational governance

In the buyer–supplier relationship, the relational governance has received much attention over the last two decades. It has been adopted by many firms in the exchange relationships to help govern the behaviors of the exchange partners. The parties who draw up the contracts cannot foresee all possible conditions although contracts play an important role in project governance. Thus, It is not enough to rely on contractual governance as a contract is usually incomplete for a project (P. Lu et al., 2015).

Macneil (1980) firstly differentiated two kinds of exchanges, i.e., relational exchange and

discrete exchange. During making a relational exchange, the exchange is examined from the past to future (Macneil, 1980). Whereas making a discrete exchange, communication is limited, and the identity is neglected. However, even the simplest model of discrete exchange there should be some relational elements. That is, in order to harmonize the behaviors among parties, almost every exchange may contain some relational factors (P. Lu et al., 2015).

C.-L. E. Liu et al. (2020) differentiate between the concept's effectiveness of relational governance and the relational governance mechanisms. Relational governance refers to a collection of behavioral routines and management techniques aimed at developing informal self-enforcing safeguards in a collaborative relationship. Relational governance effectiveness encompasses the extent to which these management strategies and routines achieve the desired collaborative behavior. Specifically, the targeted collaborative behavior is characterized by open communication, mutual influence, joint problem solving, and the aspiration to create benefits for both parties. In East Asia, building high-quality collaborative relationships is culturally embedded, and an essential theme of business strategy. Thus, a high level of relational governance effectiveness is expected to allow firms to develop mutual understanding and joint problem solving, which, in turn, result in desirable collaborative outcomes (C.-L. E. Liu et al., 2020).

Relational governance regards relational norms as a form of informal governance. Relational norms traditionally involve information sharing or exchange, flexibility, and solidarity. Our conceptualization of relational governance includes information exchange, flexibility, solidarity, and trust. Information sharing decreases information asymmetry, promotes conflict and problem solution within the exchange, as well as entails a bilateral expectation that the exchange parties will proactively provide information useful to the other partner. Flexibility facilitates the project's adaptation to unforeseeable events and pertains to a bilateral expectation of a willingness to make adaptations. Solidarity refers to a bilateral expectation that a high value will be placed on the relationship. Developing solidarity shifts the focus away from self-centered behavior towards the behavior that foster unity to arise common responsibilities and interests. Trust is also a substantial part of relational governance. Trust is regarded as a key indicator in supply chain relationships and can improve project performance in construction. Trust has been identified as one of the deterministic factors to reduce the negotiation cost, decrease the monitoring cost, and increase the possibility to attain mutually beneficial agreements. While prior research has documented that relational governance can serve as an effective governance mechanism, a recent study has shown that too much relational ties may cause opportunistic behaviors given that buyers may reduce monitoring under a high

level of relational governance (Jean et al., 2021).

2.4.2 Relational governance dynamics

Sometimes, the conditions surrounding an alliance change, which induces a change in governance structure. Some researchers have treated governance dynamics as shifts between the overall mechanisms contractual, relational and market. Alternatively, some studies document relational governance changes caused by adverse events that cause tensions or conflicts between the parties. Ariño and La Torre (1998) found that parties to an alliance may experience external shocks, they may then interact to restore balance, or alternatively see the relationship deteriorate, eventually leading to complete dissolution, which gravely change efficiency and equity (Ariño & La Torre, 1998) . Tensions may also arise within the dyad by one party acting opportunistically. Hence, the governance challenge here becomes one of interactively keeping the relationship on track to avoid termination. Because one exchange party may be lured into pursuing own interests even if a solid relationship has been established, relational governance is vulnerable when asset specificity is high. Each of the key elements of a strong relationship, such as commitment and trust , display certain vulnerabilities to opportunism (Ellegaard & Medlin, 2018).

A small but growing literature deals with governance dynamics, as well as the developmental aspects of relational governance (RG). Ellegaard and Medlin (2018) have documented three primary changes that characterize relational governance dynamics: 1) Arising tensions caused by changed exchange conditions and the interactive efforts of the parties to restore the exchange. 2) Evolving RG based on interactive experience and learning, increasing the strength of the relationship. 3) Changes cause by changed exchange conditions or one (or both) parties' opportunistic behavior, leading to exchange termination. So, changes in relational governance have mainly been documented in the form of relationship developments, building, and repairs related to tensions, or break-ups of otherwise strong relationships (Ellegaard & Medlin, 2018).

2.4.3 Relational life-cycle phases

Following a common trajectory called a relational life cycle, relationships develop through a set of sequential stages... Relationship stages being outlined also help the managers to clarify the outcomes of inter-organizational relationship approaches. How relationships begin, evolve, and dissolve over time can by understood by the relationship life-cycle theory (Jap & Ganesan,

2000).

Scholars have captured the dynamic and complex nature of each stage in relationship development by using varying definitions. For example, the four relational life-cycle phases presented by Jap and Ganesan (2000) include: exploration, buildup, maturity, and decline are the typical one. In their description of the life-cycle framework, the exploration phase is a search-and-trial period in which the potential benefits, obligations, and burdens of continued exchange are considered. In this phase the main goals are assessing the potential benefits and reducing uncertainty of continued interaction. During the buildup phase, interdependence and benefits continually increase through socialization, which by infusing with norms and values, transforms transactions into long-term commitments. During the maturity phase, the parties explicitly or implicitly pledge to achieve acceptable satisfaction and benefits and continue the relationship. In the decline phase, at least one party, or two parties among the multi-party transaction are experiencing dissatisfaction, exploring alternative relationships, contemplating relationship termination, and beginning to communicate an intention to end the relationship (Jap & Ganesan, 2000). On the relationship between governance mechanisms and project success or performance, these phases were used as reference to explore the recommendation of the relational life-cycle phases (Huang & Chiu, 2018).

2.4.4 Four network dimensions of relation governance

The main criticism of current research has been focused on the tendency to treat relationships as something disjointed, proposing routines, processes, and activities to manage each contact individually and not for the management of the network. Derived from the joint application of a market orientation in the network context, a publication proposed four dimensions in relation to four basic behaviors, or routines, for relational management (Helfert et al., 2002): (1) inter-firm coordination, associated with the establishment of formal and informal procedures for better synchronization of the relational activities of the members; (2) adaptation, referring to the modeling of diverse areas (production processes, delivery, logistics, and means of payment for products/services) to meet the capabilities and needs of the different members to best serve the market; (3) exchange, including aspects related to products/services (exchange of goods or information about the specifications of products/services, logistics, payment and delivery, and information on the advice needed regarding the products/services that are served), as well as personal aspects (construction of personal relationships that improve internal knowledge among members and even the construction of social ties), to resolve the requirements of all parties. (4)

conflict resolution, regarding the assumption by members of a disposition towards justice and the commitment that makes it possible to adopt quick and effective resolutions to those extraordinary situations typical of relational management (Irún et al., 2020).

Lots of earlier research have centered on the contractual relationship between the buyer and supplier. Projects in buyer-supplier relationships must bridge organizational boundaries and are therefore sensitive to the behavior of its representative parties. To complement previous research, focusing the intangible aspects of the relationship, we investigated the buyer-supplier relationship at the level of projects, in this case relational governance. By understanding how these intangible aspects may explain project success, the exchange between parties is guided through shared expectations and interests about each other's behavior, in accordance with transaction cost economics in a business relationship. To follow this logic, we centered attention on investigated how relational governance may explain project success as well as the related aspects of relational governance in the buyer-supplier relationship particularly in interactive offshore projects (Müller & Martinsuo, 2015).

2.5 Project characteristics

2.5.1 Project context and project environment

The definition of the term “context” could be adapted from Dey et al. (2000) even though there is an absence of a formal definition for project context: “Project context is any information that can be used to characterize the situation of project which includes mental and physical aspects” (Dey & Abowd, 2000). The mental aspects of project context include social, informational, or emotional states whereas the physical aspects of project context include the project environment as well as previous projects where the project actually resides (Joslin & Müller, 2015).

By a world-wide survey, it is illustrated that the differences in governance approaches by industry, country, and project size exist (Müller & Lecoivre, 2014). There are several of the highly cited governance sources focusing on the role of legal or institutions frameworks on governance. These contributions offer insights in a specific region or country how the legal or national context may affect to the organization of transaction. The governance structure of each specific project needs to be tailored being aligned with the characteristics of its owner; especially it is line with the ownership structure of firm (Ahola et al., 2014).

Projects exist and operate within the environments that have varying degrees of influence on value delivery. Such environments can influence project activities, such as planning. These

influences can yield an unfavorable, favorable, or neutral impact on project stakeholders, characteristics, or project teams. Project environment can be further divided into two sub category: internal environment and external environment (PMI, 2021).

Internal environment refers to factors internal to the organization can arise from the organization itself, another project, a program, a portfolio, or a combination of these. They include practices, artifacts, or internal knowledge. Knowledge includes completed artifacts from previous projects as well as lessons learned. Examples include: Process assets (tools, approaches, methodologies, templates, patterns, frameworks, or PMO resources); Governance documentation (policies and processes); Data assets (databases, metrics, document libraries, artifacts, and data from previous projects); Knowledge assets (tacit knowledge among experts, project team members, and other employees); Security and safety(procedures and practices for facility access, levels of confidentiality, data protection, and proprietary secrets);Organizational structure, culture, and governance(the vision, values, mission, beliefs, leadership style, cultural norms, organizational style, hierarchy and authority relationships, ethics, and code of conduct) (PMI, 2021).

Here the culture is mentioned the project internal environment factors, which will be as external environment factors as well. Culture embodies a set of human beliefs, norms, and actions, which can be individual and collectively observed and drive organizations into a certain level of development and economic welfare. Those pillars are the basis of the project exists (Lopes & Serrasqueiro, 2017).

External environment refers to factors external to the organization can constrain, enhance, or have a neutral influence on project outcomes. Examples include Marketplace conditions. (Competitors, market share, technology trends, brand recognition, and trademarks);Social and cultural influences and issues (regional customs and traditions, political climate, codes of conduct, ethics, public holidays and events, and perceptions); Regulatory environment (national and regional laws and regulations related to data protection, security, employment, business conduct, procurement and licensing); Commercial databases (industry risk study information and standardized cost estimating data);Academic research (industry publications, studies, and benchmarking results); Industry standards(standards related to production, workmanship, products, quality, and environment);Financial considerations(interest rates, currency exchange rates, taxes, inflation, and tariffs); Physical environment.(weather and working conditions) (PMI, 2021).

2.5.2 Project characteristics and success factors

Critical success factors (CSFs) in projects have been a substantial body of research in project management. From the recent studies on project success an important conclusion suggests that projects are not always unique, and at different stages of the implementation process projects can have different contextual factors as well as different degrees of these contextual factors. As illustrated in Table 2.4, Hussein (2019) claimed that each project therefore requires a different approach depending on the extent of each project characteristic and depending on the implementation stage (Hussein, 2019).

Many researchers have defined various characteristics affecting project performance. The study conducted by Ling et al.(2004) presented the project characteristics affecting project performances, which were divided into three categories: (i) owner and consultant characteristics, (ii) project characteristics, and (iii) the contractor characteristics (Cho et al., 2009)c.

Being reviewed with respect to their impact on performance, Locatelli et al. (2017) claimed the formulation of the following categories of project characteristics. These categories were: project environment which includes socio-economic environment, legal environment, political environment; project stakeholders, and further subdivided into external stakeholders and internal stakeholders; technological aspects ;project management and other characteristics (Locatelli et al., 2017).

Among the five groups of partnering success factors, the most important partnering success factor was trust, communication was the second most important one, the third most important was commitment, collaborative problem-solving was the fourth important, and finally mutual project objectives are very important as well (Nevstad et al., 2021).

Table 2.4 Success factors according to project characteristics

Category	Success factors
Organizational complexity (The project requires contribution from large number of organizational units/ individuals)	· Timely and purposeful information flow to various stakeholders. · Clarity of roles and responsibilities. · Project manager with adequate decision-making authority / appropriate project organization structure. Stability / continuity of project organization
Transformation (purpose of the project is to introduce substantial changes to existing work processes, systems, or procedures)	· Clarity of purpose and objectives · End-user/ client/stakeholder's involvement · Balanced project group that represent the interests of all the units/ that will be affected by the project · Project manager / management has adequate business insights (understand the needs of various group, understand the impact of the project on the users, inclusive)
Impact on business (the project has substantial	· Alignment of the organization to project purpose/ Communicate the importance of the project to the entire organization.

impact on the business or on corporate strategy)	· Mobilization and provision of support from project owner / management. · Oversight / follow up by project owner / management
Constraints (the project should be completed under one or several types of constraints, such as time, resources, requirements from authorities or other stakeholders)	· Adequate early planning. · Established routines for deviation / change control. · Collaboration within the project organization. · Collaboration between project/contractors/ (One team) · Clarity of priorities and structured requirements process.
Uncertainty (the project has considerable level of uncertainty regarding the scope of work, impact, methods, or the outcome (Hussein, 2019))	· Flexibility · Structured risk management process · Use of lessons learned from previous projects · Experience, skills, knowledge, and competence (project manager/ contractor, and project group) · Mindfulness about biases, heuristics such as over optimism, narrow focus, and assumption.

Source: Hussein (2019)

Except the literatures mentioned above, since the 1970's, academics have tried to understand what project success is and which factors contribute to it, being summarized in Table 2.5. However, its meaning is still not generally agreed upon. To answer what project success is, it should be measurable and defined in terms of success criteria (Müller & Turner, 2007). Research on project success further shows that it is impossible to generate a universal checklist of project success criteria suitable for all projects. Depending on a number of issues, for example, uniqueness, size, and complexity success criteria will differ from project to project (Westerveld, 2003).

Table 2.5 Project success/failure factors

Models	Factors type	Factors	Original Contribution
The 12 success factors	Success	1) Adequacy of organization-wide education on the concepts of risk management; 2) Maturity of a company's processes for assigning ownership of risks; 3) Visibility of the risk register; 4) Availability of an up-to-date risk management plan; 5) Adequacy of documentation of organizational project responsibilities; 6) Limiting project duration to less than three years if possible; 7). Scope changes can only be allowed through formal scope change control; 8). The integrity of the project performance measurement baseline is maintained; 9). An effective benefits management and delivery process existed; 10). Effective three levels of portfolio, program, and project management practices; 11) A suite of portfolio, program, project, and metrics; 12). Effective mechanism and culture of learning from the experience of previous projects.	(Sirisomboonsuk et al. 2018)

The three major success factors	success	The Standish Group reported three major success factors: user involvement, executive support, and emotional maturity (the collection of basic behaviors of how people working together)	(Sirisomboonsuk et al. 2018)
critical success factors	Success	1) Clearly defined goals.2) Competent project manager, 3) Top management support: 4) Qualified competence of project team members: 5) Sufficient resource allocation:6) Adequate communication channels: 7) Control mechanisms: (including planning, schedules, etc.)—compared with initial schedules and plans. 8) Feedback capabilities: through review meetings or formal feedback channels all project stakeholders and parties can make suggestions, review project status, and corrections 9) Responsiveness to clients: all potential project users are kept up to date on project status as well as being consulted with. Clients can get assistance after the implementation and delivery of project.	(Pinto & Slevin, 1987)
Five key elements for initiating successful projects	Success	1) Setting realistic priorities and desired outcomes; 2) Affordability;3) Pre-commitment – internal assessment and challenge;4) Project set-up – the lead up to binding commitment;5) Delivery and variation – maintaining delivery pressure throughout the life of the contract	(NAO, 2011)
success or failure might vary in relation to different characteristics	Success/ Failure	Selection of criteria. Organizational structure. Size of the project. Industrial sector: Different perspectives of the stakeholders: Different stages of the life cycle.	(Costantino et al. 2015)
Delivery Environment Complexity Analytic (DECA)	Success	The Delivery Environment Complexity Analytic (DECA) is a tool developed by the National Audit Office (NAO), which include the likely impact of 12 factors that are key influencers of success or failure. The 12 factors are: • Strategic importance. • Stakeholders/Influencers. • Requirements and benefit articulation. • Stability of overall context. • Financial impact and value for money. • Execution complexity (including technology). • Interfaces/Relationships. • Range of disciplines and skills. • Dependencies. • Extent of change. • Organizational capability: • Interconnectedness.	(NAO, 2013)

The success of a project is the subject of many research analyzing the factors that affect the success of a project and is also the sole goal of project investors, including the contractors as

well as owners. Some of them analyzed the relationship between the success or performance (i.e., cost, time, etc.) and the main categories (i.e., the project, the market, the owner, and the relationship among them) using regression analysis. Even several dependent variables, as, for example, in a multivariate analysis of variance, the factor and regression analyses conducted in the previous studies can establish only one relationship at a time, and can show only a single relationship between an independent variable and the dependent variables (Cho et al., 2009; X. C. Lu, 2008).

Many previous studies on the project characteristics and project success have shown the relationship between project success and a few project characteristics. However, as expressed in an arithmetic equation, and if considered in terms of the dynamic decision-making process required by the owner and the various ever-changing characteristics, the relationship between a few project characteristics and project success, may not be highly applicable, and has only a slight possibility of being considered comprehensively in terms of the project success and performance. Therefore, there should have further study to analyze the overall relationship between a project's characteristics and project success and the level of influence of the former on the latter (Cho et al., 2009; Xu, 2014).

2.5.3 Definition of project complexity

It is important to consider project complexity as the governance resources, authority structure, and processes are applied in order to balance risk and efficiency (PMI, 2016). There is a relationship between the required governance resources and processes and the complexity of projects, complexity is defined as a “characteristic of a project or its environment which is difficult to manage due to system behavior, human behavior, or ambiguity.” As project complexity increases, typically the required governance resources, processes and authority structure, increase as well (PMI, 2016).

NAO (2009) define a complex project as one where either: 1) during the project's lifetime there is a high level of change in the outcome required; or 2) over the route to delivering the project outcome at the outset there is uncertainty, or the project has aspects that have not previously been encountered. NAO (2009) also identified many factors contribute to a project's complexity. These factors include: 1) the scale of the project, particularly if there is a significant number of linked procurements; 2) a significant number of stakeholders are involved in the delivery of a project or its outcome; 3) the duration of the project, which can increase the risk that internal or external events will impact on the project; 4) a project being financed in a novel manner; 5) the use of unproven technology, or the development of a bespoke

technological solution and 6) a tight delivery timetable (NAO, 2009).

2.5.4 Complex product systems (CoPS)

Each individual CoPS is tailor-made for specific customers based on specifications and manufactured and assembled from lots of interconnected parts including sub-systems, components, control units from different vendors or contractors, whereas the sub-systems, components, control units may also be tailor made for this CoPS from sub-vendors or sub-contractors. And CoPS are often business-to-business goods used for further products, service, or goods for end customers and users (Hobday, 2000). Amounting to temporary multi-firm user alliances, prime contractors and systems integrators are responsible for managing CoPS projects. Given the nature of CoPS, project management and systems integration competencies are critical to production efficiency and effectiveness. Enabling different types of innovation actors to agree the fine detail of CoPS production and development, the project is a widely used form of coordination in CoPS. The project is responsible for coordinating decisions across firms, for realizing the market, for matching financial and technical resources, and for enabling buyer involvement through time. The project exists to communicate architectural and design knowledge and to combine the distinctive know-how, resources, and skills of the collaborators (Hobday, 2000).

Project-based firms have been concerned with innovation in suppliers of CoPS such as flight simulators which are supplied by “systems integrators” who draw on networks of specialized and other suppliers and commissioned by “users”. It is argued that project-based firms are the most appropriate for the effective and efficient supply of CoPS such as offshore rigs, medical equipment to owners and operators (Winch, 2014).

The supplier’s problem is how to deliver the CoPS that meet the client’s requirements. The project’s product and delivery process will be imperfectly defined at the outset because of incomplete contracting and bounded rationality. The goals and the methods will not be perfectly defined. This will require refining their definition as the project progresses by use of configuration management, to ensure at the end what is delivered does meet the client’s requirements indeed. Thus the client needs to be involved in the client process throughout the project, and between client and contractor creating a state of permanent bilateral dependency (J. Turner & Keegan, 2001).

2.5.5 Delivery environment complexity analytic

The Delivery Environment Complexity Analytic (DECA) is a tool developed by the National Audit Office (NAO), which include the likely impact of 12 factors that are key influencers of success or failure. The 12 factors are: • Requirements and benefit articulation • Strategic importance • Stakeholders/Influencers • Stability of overall context • Execution complexity (including technology) • Financial impact and value for money • Interfaces/Relationships • Dependencies • Range of disciplines and skills • Extent of change • Interconnectedness • Organizational capability. Users decide whether the potential impact from each factor is low, medium, or high to build an overall picture of its complexity and the delivery environment. The completed DECA gives users a better understanding of the challenges the organization faces in realizing its policy aims and/or delivering a project. It does this by drawing out where the potential risks are, considering areas of challenge, their potential opportunities, and likely consequences. The DECA includes a description of what both high and low complexity would look like for each factor (NAO, 2013).

2.5.6 Project finance

As the principal suppliers of financial resources to project organizations, Owners and operators typically do this from loans secured as a floating charge on the business or out of operating surpluses. An important exception to this generalization is the use of “project finance”. The loan is secured on the assets being generated by the project in project finance. However, the finance is raised by the owner and operator as project promoting parties, the capital budgeting process is one of the most important strategic processes by which the available capital is allocated to viable projects in any firm (Tang, 2019; Winch, 2014).

2.6 Opportunism

2.6.1 Definition of opportunism

At inter-organizational and interpersonal level many academics have recognized the importance of opportunism with significant implications. Opportunism is developed by agency theory (Fama & Jensen, 1983) based on the originally root in transactional cost economics (Williamson, 1985) and is conceptualized as “lack of candor or honesty in transactions, to include self-interest seeking with guile”. The “guile” refers to “lying, streaking, cheating, and calculated

efforts to mislead, distort, disguise, obfuscate, or otherwise confuse”. Because all contingencies cannot be predefined, all information available cannot be used for decision-making those circumstances make it challenging for managers to anticipate all sources of potential conflict and identify qualified partners. In the inter-firm relationship the nature of human limitation leaves room for the occurrence of opportunism (Um & Kim, 2018).

Transactional cost economics (TCE) perspective outlines three exchange hazards as the primary antecedents of opportunism in inter-firm relationships, i.e., relationship specific investments (RSIs), behavioral uncertainty (BU), and environmental uncertainty (EU).

Relationship specific investments (RSIs) refer to the idiosyncratic investments that have very little utility outside the relationship. Taking Chinese offshore industry as example, the COBs often make huge specialize investments to enter the offshore industry (such as investments in new technology, offshore specific infrastructure-dock and slipway, high-capacity cranes, employee training, and other physical facilities) as well as to reduce transaction costs in their exchange relationships with the downstream members, enhance performance outcomes, or improve exchange's efficiency or. Although extremely useful, these investments entail considerable risk for the COBs. Also the clients invested high down payment and project management expenditures for the offshore orders which is also RSIs, this creates a lock-in situation for the offshore owners that exposes them to the potential exploits (i.e., opportunism) and lead to the safeguarding problem of RSIs (Trada & Goyal, 2020).

Behavioral uncertainty (BU) represents the difficulty associated with ascertaining contractual compliance or performance evaluation (Trada & Goyal, 2020).

Environmental uncertainty (EU) is defined as a supplier's or an owner's difficulty in accurately predicting future outcomes and market trends in the external environment. It represents the unanticipated changes surrounding an exchange. For example, rapid fluctuation in end users' demand of the offshore facilities, rigs and projects, and severe competition of COBs in the offshore industry increases uncertainty in predicting future contingencies. Therefore, coupled with bounded rationality high environmental uncertainty, makes it extremely expensive and challenging for a partner to draft a comprehensive contract that all future contingencies could be covered. This leads to adaptation problems for the offshore project owners and contractors. Such adaptation problems are commonly faced by project suppliers in developing markets because of a higher degree of market uncertainty (Trada & Goyal, 2020).

2.6.2 Project uncertainty

The three critical dimensions for characterizing transactions are (1) the frequency with which transactions recur, (2) uncertainty, and (3) the degree to which durable transaction-specific investments are incurred. Of these three, uncertainty is widely conceded to be a critical attribute; and that frequency matters are at least plausible (Williamson, 1979). As not all future aspects of works can be envisaged in advance, project parties share uncertainties regarding ex post changes in design and specification. Accordingly, in EPC projects whether to facilitate ex post adaptations or to safeguard against them must be a fundamental question in the choice of contract. Also, unforeseen circumstances raised by external environmental factors, e.g., technological difficulties, and changing economic conditions generate uncertainties in the delivery process (Park & Kwak, 2017).

The concepts of uncertainty are originally defined as “the gap between the information an organization has and the information it needs to perform the task” (Galbraith, 1973). In most cases, uncertainty is defined by the interplay between task environment, task characteristics, and actors involved. And most researchers conclude project uncertainty from individual, environmental, complexity, temporal, information, and capability multiple perspectives, respectively (Lin et al., 2019).

According to transaction cost economics (TCE), increased transaction costs cause opportunism. Based on key TCE constructs (specific assets, environmental uncertainty, and opportunism), specific assets and environmental uncertainty create exchange hazards that result in opportunism. Meanwhile, coordination costs raised by environmental uncertainty are reduced by specific assets. The study by Huo et al. (2018) shows that supply uncertainty increases opportunism, demand uncertainty decreases opportunism. Provider specific assets decrease opportunism while user-specific assets increase opportunism. Supply and demand uncertainty has positive effects on user-specific assets, while technology uncertainty does not have a significant impact on user or provider-specific assets. In general, these findings supported the rationale of TCE (Huo et al., 2018).

Offshore projects intrinsically involving high uncertainty cause difficulties of ensuring timely arrival of goods and services from a partnering firm, prescribing specifications, and explicitly specifying responsibilities, roles, and activities. The difficulty and incompletes of a contract may leave room for opportunism. A partnering firm is likely to be tempted to hide genuine efforts into the achievement of a project under high uncertainty of offshore projects, and the unethical behaviors can leave the success of a project unpredictable (Um & Kim, 2018).

2.6.3 Antecedents of opportunism and its consequences

For studying opportunism, most studies apply transactions cost analysis (TCA) and social exchange theory (SET) as principal theoretical perspectives. TCA recognizes behavioral and environmental uncertainty, asset specificity as core antecedents of opportunism. Typical SET-antecedents of opportunism are corporate social capital, ethical values, perceived fairness, other relational norms, and trust. A trigger initiates the course of events, while a cause indicates the reason(s) for that something to happen. Enablers are the conditions that facilitate the actors to react in response to certain triggers. Powerful parties in a relationship are not automatically inclined to behave opportunistically. A dominant position facilitates and enables opportunistic behavior, but is not a trigger initiating opportunism (Gelderman et al., 2020).

As show in Table 2.6, Hawkins et al. (2008) provide a brief review of two critical theories of exchange that provide a theoretical foundation for opportunism. And they discussed each of the antecedents and consequences (Hawkins et al., 2008).

Table 2.6 Antecedents and consequences of opportunism

Antecedents to opportunism	Dependence, the predominant construct affecting opportunism is dependence. Dependence is defined as existing when the rewards sought and received in a relationship are not available outside the relationship. Formalization, in addition to dependence, the degree of relationship formalization seems to strongly affect opportunism. Relational norms, the previous discussion on SET introduced relational norms as phenomena that can mitigate opportunism. Relational norms “are expectations about behavior that are at least partially shared by a group of decision makers” that” have been shown to govern individual exchange relationships between firms”. Uncertainty, following TCA theory, bounded rationality renders uncertainty a permanent fixture in contractual relations. “Combining uncertainty with market contracts often leads to a series of renegotiations and contingency clauses as disputes arise and the uncertainty is resolved”
Consequences of opportunism	Performance, from an applied perspective, the effect of opportunism on performance may be the most interesting relationship. Performance has been operationalized in terms of a superior physical distribution system, aggressive innovation, effective marketing efforts, strategic needs, and indirect performance indicators, and profits Firm boundaries (make or buy), the impact of opportunism on a firm's acquisition strategy is rooted in TCA theory. Two studies examined the prediction of TCA theory that: (1) where opportunism costs are high, firms will assimilate the activity into their own hierarchy, and (2) where opportunism costs are minimal, firms will procure the items/services from the market. Both studies occurred in the technology industry. Costs, TCA theory predicts an increase in transaction costs resulting from opportunism. Other, in addition to firm performance, firm boundaries, and costs, opportunism impacts several other variables important in buyer– supplier relations. From TCA theory, these variables include contractual safeguards and TSA investments

Source: Hawkins et al. (2008)

2.6.4 Buyer's opportunism

A phenomenon of significance in buyer–supplier relationships is opportunism. The study by Hawkins et al. (2013) found factors to affect buyer opportunism included corporate ethical values, buyer power, honesty/integrity, willful ignorance, leader opportunism, and subjective expected utility. The study also provides empirical support for distinguishing between two types of opportunism — strong and weak (Hawkins et al., 2013)

When it is the actual decision maker in the relationship with the vendor, an opportunistic client can willfully display such behaviors. While these behaviors benefit the client, especially when client is the more powerful partner in the relationship, they create a problematic situation for the vendor. Vendor may sense distrust and risk as being the weaker partner, and thus lower hope about the prospects of the client relationship. In adverse circumstances, vendor may experience lower revenue, higher cost, and reduced returns on investment. Therefore, client opportunism is bound to elicit both behavioral and affective response from the vendor (Chaudhry et al., 2018).

Gelderman et al. (2020) claimed that in many cases buyer opportunism appears to be an integral part of the company culture or is driven by top management. Purchasers feel pressure to achieve short-term results, or regularly act on explicit instructions from their superiors, or they are compelled to follow unworkable procedures and protocols. In some instances, buyers intentionally may want to downgrade a (less-satisfactory) strategic relationship into a leverage relationship. The results indicate that opportunistic behavior often appears to be a conscious choice by a purchaser, based on a balanced assessment of risks and consequences (Gelderman et al., 2020).

2.7 Governance framework

2.7.1 Three domains of project organizing

Drawing on transaction cost economics, Winch (2001) presented a conceptual framework (Figure 2.5) for understanding the governance of construction project processes. He claimed that earlier studies attempt to apply this theoretical framework in construction project management have been partial, in which have focused on typically that between client and principal contractor, as well as only one type of transaction. His study aims to be covering all the different transactions and be comprehensive throughout the project lifecycle within one conceptual framework. The conceptual framework for the governance of transactions through

the construction project lifecycle as illustrated by Figure 2.5 combines the presently diverse perspectives of economics, construction law, and management. Winch (2011) claimed that in order to explain the full diversity of construction project governance modes both within and across different national institutional contexts, the task of developing this conceptual framework should be engaged (Winch, 2001).

After that, Winch (2014) proposed a conceptual framework (Figure 2.6) of project organization, which consists of three organizations both permanent and temporary. The three principal organizational types of projects showed by the conceptual framework shows in the organizational field—the relatively permanent owner and operator; the temporary project or program; and the relatively permanent project-based firm as supplier, two of them are relatively permanent types of organizations and one is temporary organization (Paul, 2012). They are proposing as the three domains of project organizing. This model is also applicable to the offshore projects, which the offshore owners supply the capital resources to the project organization as investors; and the project-based firms COBs provide the human and material resources to the project organization (Winch, 2014).

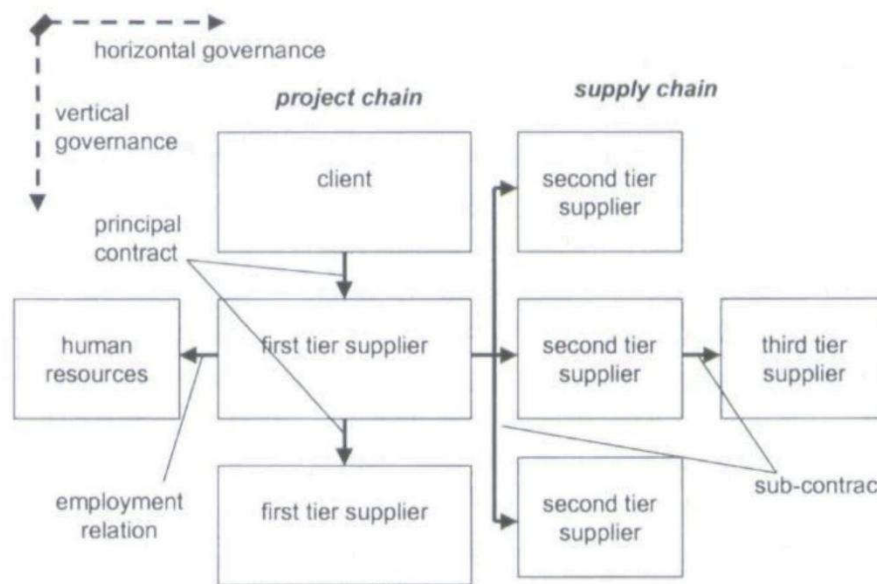


Figure 2.5 Vertical and horizontal transaction governance in the project value system.

Source: Winch (2001)

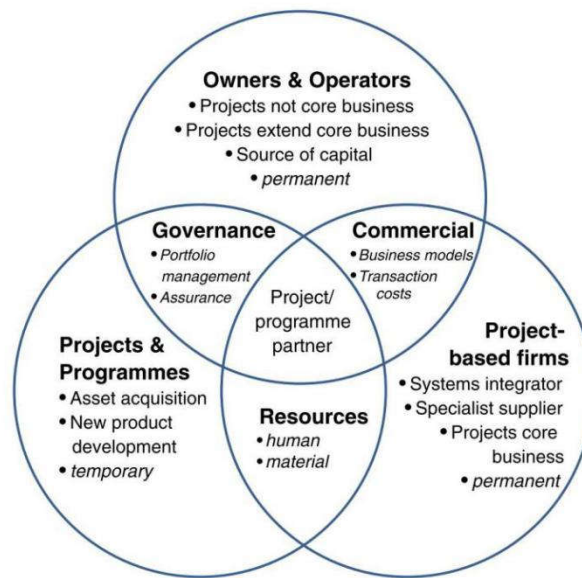


Figure 2.6 Three domains of project organizing.

Source: Winch (2014)

As with many conceptual models, the most interesting areas are probably not the main circles identifying the three domains of project organizing, but the interfaces between the domains in the Venn-like overlaps. Indeed, these interfaces supply some of the most interesting and currently challenging areas of research in project organizing—governance, commercial and resourcing—so we turn to these seriatim. Which these interfaces will be the focusing point of this study as well (Winch, 2014).

2.7.1.1 Project governance-owner and stakeholders

The relationship between project management and governance is more complex than a one-to-one relationship. The governance gap as described above widens and becomes multifaceted, as shown in Figure 2.7. Emerging from these considerations, we can conclude that the multi-organizational context of development projects forces opens systematic project governance (Renz, 2007).

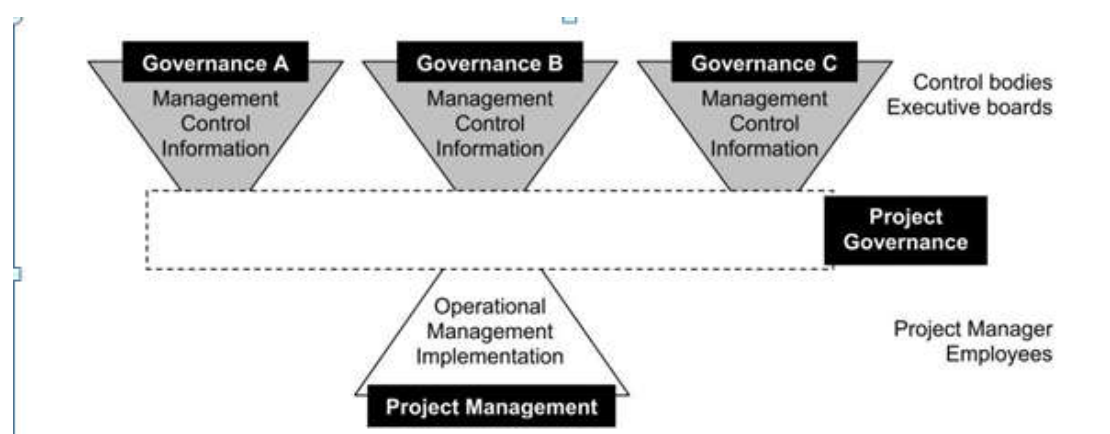


Figure 2.7 The Stakeholders and Owners of Project Governance

Source: Renz (2007)

2.7.1.2 Owners and their projects organization

The relationship between owners and their projects can be summarized as the challenge of governance, or whether owners and operators selected the most appropriate projects as desired. Broadly speaking there exist two largely literatures of relevance. The first is on project portfolio management, tend to be incomplete and fall short of the widely accepted definition of “a group of projects that are carried out under the sponsorship and/or management of a particular organization” (Winch, 2014). The second, project assurance, is some kind of stage-gate process which addresses the “who, when, what” questions, as well as who should make decisions on the progress of the project (Winch, 2014).

2.7.1.3 Owners and project-based firms

A different commercial perspective study exists which focuses on the business models used by project-based firms aiming to investigate the range of different operation activities and services that suppliers can offer to the owner with respect to the projects they promote, in a broader perspective of “project marketing”. The project marketing literature mostly intends to approach commercial issues from the perspective of the supplier. However, the central question to transaction cost economics is the nature of the relationships between the owner and operator and its suppliers of project services. From this perspective, further literatures needs to pay more attention to the dynamics of the relationships between firms (Winch, 2014).

Even Winch tried studied the project management from the TCE perspective previously, he still claimed that one of the most influential perspectives in business and management underpins much of contemporary organizational economics and organization theory with limited attempts to apply it to the domain of construction economics and management. An important exception to this statement is the application of TCE to the governance of inter-firm relations in projects,

but the opportunity is presently being missed for a more thorough-going application (Winch, 2015).

2.7.2 Governance framework

2.7.2.1 Governance framework

A governance framework is an institutionalized artifact, as people must comply with it – it is ‘structuring’ in the case of project governance. Governance (embodied through artifacts, the ‘material’) and governing (embodied through practices, the ‘social’) are mutually constitutive (Brunet, 2019). A specific governance regime must adapt to its context and the project. Klakegg et al. (2008) claimed and accepted the general form of a “governance framework” applicable to any project, which should be flexible enough to fit projects of complexities, types, and sizes. Governance framework is defined as: “an organized structure comprising principles, rules, procedures and processes established as authoritative within the institution to ensure projects purpose being realized”. The project meeting its purpose is a way of defining its success. It implies both achieving a sustainable effect and delivering the relevant solution in an effective way (Klakegg et al., 2008).

2.7.2.2 Structure of the frameworks in the United Kingdom

In the United Kingdom, the chief elements of the Office of Government Commerce (OGC) framework are the Gateway Reviews. The private-sector engagement comes from the use of private-sector-experienced consultants who have been individually accredited by the OGC for Gateways. The well-defined six Gateways are standardized, and Gateways 1 to 5 are at project level:

- Gateway Review 0: is Strategic management (several times where appropriate).
- Gateway Review 1 is Business justification.
- Gateway Review 2 is Procurement strategy.
- Gateway Review 3 is Investment decision.
- Gateway Review 4 is Readiness for service.
- Gateway Review 5 is Benefits realization (Klakegg et al., 2008).

2.7.2.3 The framework of Norway

The Ministry of Finance of Norway has entered into a framework agreement with seven constellations of consultants to perform quality assurance (QA1 and QA2) on major public investment projects (NTUN, 2008). The whole framework is a control measure. The framework is simple, consisting of two gateways— (1) QA1, the early choice of concept, includes the control of four documents: a needs analysis, an overall requirements specification, an overall objectives/strategy document, and an analysis of alternatives for the decision to initiate project

preplanning. The project must pass at all these stages to continue, and no shortcuts are allowed. In the framework, the important logic of QA1 is to make sure that the project is begin on real needs, and thereafter had choose a strategy and a concept accordingly at a very early stage. (2) QA2, the GO decision to finance the project, includes the control of one document, the project management plan, with several subdocuments (progress plans, cost estimates, risk analysis, organization, contract strategy, etc.). The format is standardized to include elements such as contracts, uncertainty analysis, pitfalls and success factors, scope, flexibility, and organization (Klakegg et al., 2008).

Chapter 3: Research Method

3.1 Research conceptual model

This study uses a high-level conceptual model of project management domain to link the characteristics of project and opportunism (as two independent variables) to project success (the dependent variable, divided further into two variables: project efficiency, project success), in direct relationships and mediated by project governance, relation governance.

Project success, which is this study's dependent variable, is defined in terms of – meeting cost, time, and scope goals (Project efficiency) and meeting wider business and enterprise goals from PBFs perspective (Project success). Project characteristics (PC) can have one or more of the following characteristics: project environment characteristics (EC), project owner characteristics (OC), project contractor characteristics (CC). Opportunism(OP), the other independent variable, is conceptualized as the extent to which the partnering firm commits apparently illegal and unethical behaviors or blatantly violates the contract and fail to fulfill its obligations (Um & Kim, 2018). It is expected that these characteristics as identified by the PC of the project, as well as OP will directly or indirectly affect project efficiency and project success, both at project-level and firm-level performance, thereby contributing to the project business of project-based firms (PBF).

Previous empirical research reports on factors that project efficiency and links them to the achievement of project success from the PBF's perspective. So, the conceptualization in this study is extended to explore the mediating effect of project efficiency on the relationship between the independent variables and dependent variable-project success. In such case, one of the hypotheses for this study is: Project efficiency mediates the effect of the PC on project success. The project characteristics increase firm-level performance project success via increased project-level project efficiency. The direct and mediating effects in the relationship between project characteristics, project-level project efficiency and firm-level project success (conceptualized in Figure 3.1) are tested using SPSS and AMOS.

It is essential to the stability of buyer–supplier relationships. Project governance sets the objectives of the project and determines the means to attain those objectives and monitor the performance of the project. Project governance involves a set of relationships among partners, including sponsor, contractor, client and other stakeholders (P. Lu et al., 2015).

Contractual governance and relational governance are two mechanisms in the inter-

organizational exchanges. Although contracts play an important role in project governance, the parties who draw up the contracts cannot foresee all possible conditions due to the Bound Rationality of human beings, especially for the projects that are unique and one-off. Relational governance from social processes, including relational norms, trust, etc., can mitigate the exchange hazards targeted by formal contracts, and minimize transaction costs compared with the formal contracts (Jugdev et al., 2020).

The present research addresses project governance in a way that maximizes the chances of project success. As independent variables, four factors that are proven to be related to project success were selected. The factors are project governance, relational governance, project characteristics, and opportunism. Each model has strengths and weaknesses, and these are offset and complemented by combining the various models. We have built a research model, as shown in Figure 3.1, composed of six theoretically well-grounded variables. By assembling these six variables in our research model, we believe that together they can offer a more consistent characterization of the dimension of project governance framework.

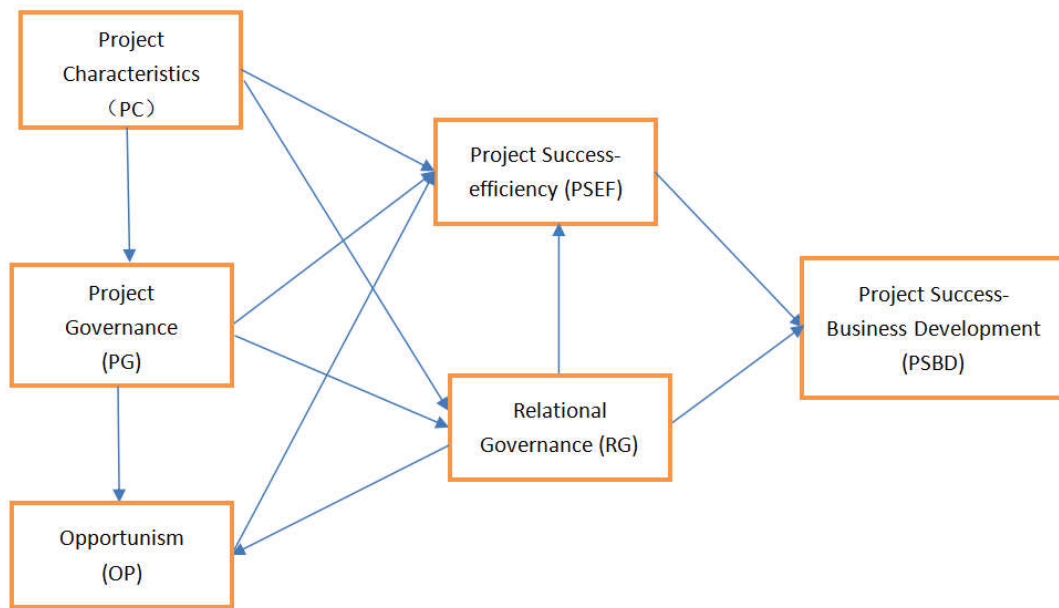


Figure 3.1 Research Conceptual Model

3.2 Research hypotheses

Based on the research model and the literature review conducted, the research hypothesizes are developed in this subsection.

3.2.1 Project characteristics

At different stages of the implementation process, projects are not always unique and can have different contextual factors as well as different degrees of these contextual factors. In order to comprehend the challenges that these characteristics contribute to project execution, grasping the scope and extent of project characteristics is necessary (Hussein, 2019).

In the planning stage for the successful execution of the project, project characteristics that affect the level of project performance demanded by the owner (Cho et al., 2009).

In the successful delivery of construction projects, mostly prime contractors play a vital role. However, the success of the prime contractors depends on the performance of the selected qualified subcontractors. Therefore, it could lead to a delay, claim, and cost overrun, loss of profit, litigation, and poor-quality if being with inappropriate selection of subcontractors. The five main prequalification criteria are financial capacity/stability of subcontractors, expected completion date, previous performance of subcontractors, health and safety records, and tender price & quotations submitted (Olanrewaju et al., 2022).

Contractors' managerial capabilities are also related to the level of efficiency and effectiveness of the project execution. It is likely to diminish with increasing degree of design completeness by the increasing level of capability (Park & Kwak, 2017). A contractor's track record is an important variable as well. They must have ability in financial, health and safety management and have completed similar projects in the past to acceptable quality (Ling et al., 2004). Project management assets with one or more of the following characteristics – rare (R), valuable (V), and inimitable can contribute to competitive parity or temporary competitive advantage (Mathur et al., 2014).

Wuni and Shen (2022) claimed the top five significant success factors for integrating circular economy principles into projects include early understanding and commitment of the client, early design completion and freezing, adequate knowledge and experience of the project team, effective leadership and support of a specialist contractor, and information sharing and collaborative working among project teams. For implementing circular modular construction projects successfully these underscored the significance of the planning and design stages (Wuni & Shen, 2022).

To foster cooperation with customers, manufacturers usually deploy specific investments (SP) to their customers' implement, which such SP are likely to incur potential opportunism from their customers. The results of study by K. Wang et al. (2021) show that, manufacturer's SPs have a positive direct effect, but a negative indirect effect through customer integration, on

customer's opportunism. Their findings provide insightful guidelines for manufacturers to protect SPs, thus solving the conflict in investing for benefits and opportunism (K. Wang et al., 2021).

Offshore projects are often over budget, delivered late, and providing less benefit than expected, and are amongst the most controversial in brief. The importance of the strong influence of both external and internal stakeholders, as well financial support, mainly in relation to their early engagement and to their technological characteristics, nationality, and the presence of Special Purpose Entities (SPE) are correlated with the offshore projects performance (Locatelli et al., 2017). The predominant causes of delay are poor labor productivity, design changes, and inadequate planning (Kaming et al., 1997). Project team diversity, team autonomy, and client collaboration have significant positive relationships with project agility. Project agility has a significant positive relationship to project success. The relationship between project agility and success is partially mediated by the project team members' adaptive performance (Radhakrishnan et al., 2021).

These prior studies, while examining project characteristics and project success, shows that there are impacts of project characterizes on project success. It is not clear how the project characteristics affect project governance and relation governance. A better understanding of the impact of project characteristics on project governance as well as on relation governance would have implications for the academic and practice. It is also not clear how the project characteristics affect project business success through the project efficiency. The research presented in this paper attempts to address this gap in understanding by examining the relationships linking project characteristics, project governance, relational governance, project efficiency and project success. So, the hypothesis is:

H1a

Project characteristics have a positive influence on project governance.

H1b

Project characteristics have a positive influence on relational governance.

H1c

Project characteristics have a positive influence on project success-efficiency.

H1d

Project characteristics have a negative influence on opportunism.

H1e

The relationship between project characteristics and PSBD is mediated by PSEF.

3.2.2 Project governance

3.2.2.1 Project governance and project success

International empirical evidence has been presented to show that effective project governance is instrumental in driving projects to success (Young et al., 2020).

Müller et al. (2017) indicate that governmentality has a positively relationship with organizational level-project success and project level success (Müller et al., 2017). From a stewardship theory and agency theory perspective, Joslin and Müller (2016) look at the relationship between project governance and project success. Project governance was operationalized respectively as a) the extent of behavior versus outcome control, and a) the extent of shareholder versus stakeholder orientation. The results indicate that project success correlates with increasing stakeholder orientation of the parent organization, and support the importance of stewardship approaches in the context of successful projects (Joslin & Müller, 2016).

Young et al. (2020) provided a theoretical explanation for why project governance leads to success and concluded that project governance is a multi-level phenomenon. The theoretical framework is built on theories of planned change and corporate governance theories. It appears that project governance is better understood through change management theories and corporate governance (Young et al., 2020).

As top management support is necessary for projects to succeed, project governance has been linked to project success. Young et al. (2020) found five project governance dimensions (Vision, KPI, Sponsor, Change, and Monitor) significantly correlate with project success, and in the project lifecycle governance mechanisms are effective at different stages. The identification of a particular governance mechanism is most effective in the project lifecycle, which is particular finding value of this research (Young et al., 2020).

The article by Brunet (2019) advanced a conceptualization for governance-as-practice — both from strategy-as-practice and project-as-practice. He unfolds as it is translated into projects, the knowledge articulation process of an institutional project governance framework, document and understand governmental practices in order to gain deeper insights about project governance (Brunet, 2019).

Quantitative studies on project governance and success show lots of variation in the role of governance in project success (Joslin & Müller, 2016).

Sirisomboonsuk et al. (2018) addressed the question how project performance is enhanced through exploring the relationships among project governance, information technology (IT)

governance, and project performance. The results suggest that project governance is positively associated with project performance. Moreover, the three dimensions (i.e., portfolio direction, disclosure & reporting, project sponsorship and project effectiveness & efficiency) of project governance are found to have positive impacts on project performance.(Sirisomboonsuk et al., 2018).

Musawir et al. (2017) indicate effective project governance directly improves project success as well as do through an enhanced benefit management process. Additionally, the most effective benefit management practices and project governance for improving project success are identified, such as a high-quality project business case is developed and being monitored from time to time. He claimed that the complex relationship between the project and the organization is not addressed by the theory of project, and there is a lack of a theory identifies the processes through which project governance improves project success (Musawir et al., 2017).

Soltani (2020) examined the alignment and relationship between project strategy and business and their impact on the success of information and communications technology (ICT) projects. The results indicate that business strategy shows no impact on project success while project success is too positively influenced by project strategy. In addition, alignment between project strategy and business strategy affects project success positively (Soltani, 2020).

Manufacturing companies are increasingly challenged to transform to solution-centric from hardware-centric. Teoh et al. (2021) initiated a case study, and the findings suggest that the chances of success are enhanced by the custom project life cycle being coupled with custom project governance. Additionally, it is found becoming part and parcel for the success of manufacturing organization transformation, the use of custom project governance , coupling with custom project life cycle , would enhance the chances of success further (Teoh et al., 2021).

3.2.2.2 Mediation of relational governance

Client involvement can be understood through the lens of transaction cost theory and represents the collaborating with the vendor and client's specific investments in relationship building. The nature of client involvement is meaningless for another relationship other than specific one ongoing vendor relationship. At multiple hierarchical levels, client can be involved in a vendor relationship i.e., senior, middle, and lower level of management. In maintaining the relationship, taking critical decisions and giving strategic direction, senior management can be involved to ensure that the relationship outcome is both sustainable and beneficial (Chaudhry et al., 2018).

Project management (PM) and benefits management (BM) are two interrelated approaches

to the success of projects, Badewi (2016) suggest that a significant proportion of organizations should adopt benefits management and project management concurrently. PM practices were not only found to affect project investment success but also influence project management success. Nevertheless, when BM and PM practices are combined together the probability of project success is enhanced significantly (Badewi, 2016).

Musawir et al. (2017) lend support to that Benefit Management (BM) was found to partially mediate the relationship between effective project governance (EPG) and project success (PS), thus indicating that a strong governance climate would encourage the development and leadership of a BM process in projects (Musawir et al., 2017).

Benítez-Ávila et al. (2018) shows that with its elements of relational norms and partners' trust, relational governance acts as a mediator leading to project performance between contractual governance and partners' contributions. This suggests that relational governance elements should be as compensators of contractual governance. This raises how the interplay between contractual governance and relational governance is (re) constituted over the life-cycle of a PPP project (Benítez-Ávila et al., 2018).

Collaborative infrastructure projects use hybrid informal and formal governance structures to manage transactions. A finding of the study by Chen and Manley (2014) was that as predictor of project performance variance, the informal mechanisms (non-contractual conditions) is a greater one than that of formal mechanisms (contractual conditions). Further, the impact of contractual conditions on project performance is mediated by the non-contractual features of a project (Chen & Manley, 2014).

As discussed above, previous studies have uncovered a variety of critical factors, including effective project governance mechanisms that can trigger project performance. However, an obvious question that emerges is how effective these governance mechanisms are at improving the performance and success of the projects, especially the offshore project in the presence of project characteristics and opportunism factors (Haq et al., 2019). The direct relationship between project governance and project success has been discussed quite a lot in the literature from various perspectives (Musawir et al., 2017). Project governance was recommended as a strategy to improve project performance and lack of effective project governance is one of the reasons for poor project performance (Sirisomboonsuk et al., 2018). Quantitative studies on project governance and success were mainly done in the IT industry and the number of quantitative studies is limited and industry specific (Joslin & Müller, 2016). Furthermore, it is found well-defined and responsive governance structures to be a critical success factor for Public-Private Partnership (PPP) projects (Musawir et al., 2017). A study by (APM, 2011)

found that among success factors, good governance has the strongest and most consistent relationship with all dimensions of project success (Musawir et al., 2017) .

So, the hypothesis is proposed as following:

H2a

Project governance is positively associated with project success-efficiency.

H2b

Project governance has a positive influence on relational governance.

H2c

Project governance has a negative influence on opportunism.

The previous hypothesis posits a direct relationship between project governance and project success in line with various empirical studies discuss above. About the mediating relationship between project governance and project success, we found no literatures. The traditional view is that project governance leads to project success(Joslin & Müller, 2016). In the preceding discussion, we highlighted the role of project governance in facilitating the adoption and implementation of relational governance. Subsequently, we discussed the role of contract governance and relation governance in improving project success. Hence, it logically follows that enabling effective relational governance may be one of the mechanisms through which project governance improves project success. Based on the organization boundary of formal rules to support exchange in comparison to informal rules and trust influencing behavior, the mediating role of relational governance elements is supposed (Benítez-Ávila et al., 2018).

So, the hypothesis is proposed as follows:

H2d

The relationship between project governance and PSEF is mediated by relation governance.

3.2.3 Relation governance

3.2.3.1 Relation governance and project success

There is a growing body of literature evidence supporting for the relationship between collaboration and performance. Information sharing enables partners to collaboratively develop a product, accurately predict demand and market changes, and reduce potential errors. Both joint incentive alignment and decision-making strengthen responsiveness in a timely manner. Therefore, collaboration may serve as a facilitator of performance (Um & Kim, 2018). Rooted in the domain of project governance and in order to achieve a project efficiency and better project success, relational governance has been considered as a critical factor. It has also been

deemed as a necessary condition for the project success supported by the project supplier, which is usually a project-based organization (Bhatti et al., 2021).

Nevstad et al. (2021) presented findings from an investigation into three criteria in the project performance measure, i.e. budget, time schedule, and technical specifications, a main conclusion is that in order to meet all three criteria in the project performance measure, mutual commitment and project objectives are important (Nevstad et al., 2021). Jugdev et al. (2020) argued that through processes and systems for organizational communication and integration, organizational support for project management is likely to positively impact firm-level performance, and this relationship is also mediated by other processes besides project management (Jugdev et al., 2020). Based on social exchange theory (SET) and transaction cost economy (TCE), a study by Huang and Chiu (2018) indicates that in the buildup and maturity phases, relational control remains positively associated with collaborative performance. In the decline phase, both relational control and contractual control have an insignificant impact on collaborative performance (Huang & Chiu, 2018). The study by Bstieler and Hemmert (2015) reveals that between partners the strength of prior business ties enhances relational governance and indirectly contributes to collaboration satisfaction. The positive returns on collaboration satisfaction are diminishing when both governance mechanisms are applied simultaneously (Bstieler & Hemmert, 2015).

In different project governance contexts, Müller and Martinsuo (2015) identified the impact of relational norms on project success and found that in the buyer-supplier relationship relational norms are positively associated with project success. This relationship is moderated by the strictness of project governance. Lower levels of managerial flexibility are supportive of project success in cases of high relational norms and detrimental to project success in cases of weak relational norms (Müller & Martinsuo, 2015). Relational governance effectiveness is important for collaborative satisfaction in inter-firm relationships and leads to better efficacy in alliance execution. Therefore, relational governance effectiveness is a significant predictor of alliance performance (C.-L. E. Liu et al., 2020).

3.2.3.2 Relation governance and opportunism

The results of the study by Haq et al. (2019) indicate that relational governance and contractual governance significantly influence project performance. And relational governance and contractual governance are useful in reducing opportunism (Haq et al., 2019).

Trada and Goyal (2020) found that communications (instrumental and social) have tripartite effects on partner outcomes, i.e., a) weakens (negatively moderate) the positive effects of

exchange hazards (antecedents) on opportunism; b) it directly reduces partner members' opportunism, and c) curtail the ill effects of opportunism on relationship performance. Additionally, the study finds that social and instrumental communications can have nuanced effects on partner members' opportunism (Trada & Goyal, 2020).

P. Lu et al. (2015) addresses the effectiveness of relational governances and contractual governance in improving project performance as well as restricting opportunism in construction. The results show that the relational and contractual governances as complements rather than substitutes are important to improve project performance. The relational governance is more powerful in restricting opportunism (P. Lu et al., 2015).

In the buyer–supplier relationships, Tangpong et al. (2010) examined the effect of relational norms on opportunism. Drawing from the theoretical grounding of transaction cost economics, three distinct perspectives are proposed on opportunism mitigation in buyer–supplier relationships: (1) individualist, (2) organization list, and (3) interactionist, where relational norms, serve as one of the key predictors in these three perspectives (Tangpong et al., 2010).

Drawing from relational governance and social network theories, the study by Tse et al. (2019) indicate that relationship commitment leads to reduced opportunism, and these effects are subject to two types of uncertainty wherein the focal exchange relationship resides. Specifically, environmental uncertainty—an external source of uncertainty, whereas behavioral uncertainty—an internal source of uncertainty (Tse et al., 2019).

The study by Handley and Angst (2015) examines the effects of relational governance and contractual governance on provider opportunism, incorporating the moderating influence of national culture. The results reveal that relational governance is more effective in high uncertainty avoidance and collectivist societies. While, in mitigating opportunism, the mechanisms are generally complementary, a singular focus on either relational or contractual can be just as effective under situations of high collectivism and individualism, respectively (Handley & Angst, 2015).

Based on the literature on relationship marketing, Dong et al. (2017) proposes that in a channel relationship, the relationship marketing orientation positively relates to relational governance, and relational governance further affects channel partners' opportunistic behaviors (Dong et al., 2017).

Paswan et al. (2017) indicates that the interaction between solidarity and formalization enhances opportunism, while interaction between role integrity and formalization reduces opportunism. On the other hand, while the interaction between solidarity and participation reduces opportunism, participation's interaction with role mutuality and integrity seems to

enhance opportunism (Paswan et al., 2017).

Using China's developing third-party logistics (3PL) industry as a research context, and transaction cost economics and social exchange theory as the theoretical lenses, Huo et al. (2016) find that solidarity and detailed contracts are effective safeguards in reducing 3PL providers' opportunistic behavior. Furthermore, detailed contracts and the contract application process, can influence 3PL providers' opportunism negatively and positively, respectively, while flexibility is positively related to detailed contracts and the contract application process (Huo et al., 2016).

The study by Zhou et al. (2015) showed that relational norms have a negative effect on opportunism. A low level of relational norms prompts joint planning to inhibit opportunism. Whereas a high level of relational norms reverses these effects: joint problem-solving curbs opportunism, and joint planning fosters, it. Thus if the goal is to reduce opportunism, collaborative activities with different properties need to be devised in accordance with relational norms (Zhou et al., 2015).

3.2.3.3 Hypothesis

As discussed previously, the intangible aspects of the buyer-supplier relationship in a business-to-business context have been discussed over the last two decades. Many firms in their exchange relationships have begun to adopt this approach to help govern the behaviors of the exchange partners. As a result, for resolving conflicts friendly, good relationships with all involved parties are absolutely critical (P. Lu et al., 2015). Where a client and supplier are engaged in the same project, relation governance is viewed as a feature of the business relationship, as perceived by persons involved. We purposefully exclude the technical aspects of the contractual governance. Instead, we focus attention to the intangible and social aspects of the relationship, namely informality, information sharing, flexibility, and mutual trust. We intend to take into account both the seller's and the buyer's viewpoint to relational governance (Müller & Martinsuo, 2015).

Thus, we propose our hypothesis as following:

H3a.

Relational governance positively affects project success-efficiency.

H3b.

Relational governance negatively affects project opportunism.

H3c.

Relational governance positively affects project success-business development.

3.2.4 Opportunism

3.2.4.1 Opportunism and relation governance

Opportunism indicates that a partnering firm will not only exploit the other involved parties but also seek its own interests in the project-based relationship. The types of opportunistic behaviors vary from failing of fulfilling obligations, deliberately violating promises and responsibilities unless supervised to manipulating data and distorting facts (Wathne & Heide, 2000). A partnering firm's opportunistic behavior hinders project achievement, undermines collaboration efficiency, and even can break up partnerships (Um & Kim, 2018).

Pathak et al. (2020) reports that actors' opportunistic behavior, new business model and technological disruptions challenges lead to value co-destruction (in the form of conflict and business liquidation, termination of relationship) using the transaction cost theory lens. Alliance partners need to evaluate the strategic benefits of collaboration, learning, knowledge sharing, market expansion, trust building and technology sharing, considering partners' self-serving behavior driven by transaction cost economies (Pathak et al., 2020).

3.2.4.2 Opportunism and Project Success

The study by Um and Kim (2018) focusing on the disclosed nature of opportunism and suggested that higher level of project uncertainty leads to opportunism and opportunism acts as a barrier against project performance (Um & Kim, 2018).

Specifically, Pathak et al. (2020) revealed that all the actors in project Alpha Vendor's ecosystem displayed opportunistic behavior, and the impact of actors' opportunism on value co-destruction include three key themes: termination of relationship, business liquidation and conflict (Pathak et al., 2020). Inter-firm opportunism affects organizational performance through a mediating process including commitment, overall satisfaction, functional conflict, and trust. Commitment is found to act as a major moderating construct between inter-firm opportunism (X. Wang & Yang, 2013).

Musarra et al. (2021) argues that the direct effect of partner-based opportunism, differ according to the alliance activities context (i.e., downstream vs. upstream). Partner-based opportunism is indeed associated with performance inefficiencies according to the observation of the authors. And the link partner-based opportunism to performance efficiency is negative moderated by alliance partner size among downstream (Musarra et al., 2021).

In the context of offshore projects, several issues such as high levels of uncertainty, extensive competition between COBs to win contracts, and, particularly, the riskiness

associated with a developed project may lead to opportunistic behavior by either party. Typical opportunistic behaviors include concealing the corporate information, illegal subcontracting, and the false declaration of the project information, bluffing, and stealing. Highly opportunistic firms often lack honesty or frankness in communication. In the short run, opportunism may increase the benefits for the one or two party. However, in the long run, the results of opportunism will create barriers, reducing the firm's revenues and hinder value creation (Haq et al., 2019).

3.2.4.3 Hypothesis

Even though few research reveals that opportunism does not have a direct negative impact on project performance or project success, however, most literatures supports that opportunism overall has a negative effect on factors that improve performance, such as trust, commitment, and satisfaction (Haq et al., 2019). It is not clear whether the link from the opportunism to PSBD is mediated by PSEF. A better understanding of the mediation effect of PSEF would have implications for the academic and practice. The research presented in this paper attempts to address this gap. So, the following hypothesis are proposed:

H4a:

Opportunism is negatively associated with project success efficiency.

H4b:

The relationship between opportunism and PSBD is mediated by PSEF.

3.2.5 Project efficiency and project success

To fairly and accurately evaluate project success, should over multiple time frames consider the views of multiple stakeholders (R. Turner & Zolin, 2012). Serra and Kunc (2015) reinforces organizations need to redesign their success criteria to increase the dimensions related to the creation of value for the business. Instead of evaluating the success of projects from the perspective of creating value for the business, some organizations are still mostly evaluating based on project management success only (Serra & Kunc, 2015).

Compared to the traditional so-called iron triangle of project efficiency, overall project success is a much wider concept than. Serrador and Rodney Turner (2014) investigated to find that project efficiency is 56% with overall project success (Serrador & Turner, 2014). This supports the assertion that project efficiency is an important contributor to overall project success (R. Turner & Zolin, 2012).

ERP investment success is associated with the organization's project (Badewi & Shehab,

2016). When benefits management (BM) and project management (PM) practices are combined, the project success will be enhanced significantly. Therefore, to uncover the interweaving relationship between the two practices, a governance based framework need be developed (Badewi, 2016).

Jugdev et al. (2020) validates that project-level performance has a significant and positive impact on firm-level performance. The research findings also indicate that the effect of project management characteristics on firm performance is significantly mediated by project-level performance (Jugdev et al., 2020).

Project agility has a significant positive relationship to project success, which project success measured by on-budget completion, on-time completion, specifications' attainment, and success rating by the project sponsor, client, and project team members (Radhakrishnan et al., 2021).

This study by Maqbool (2018) identified multiple critical success factors (CSFs), and though in renewable energy projects show that the efficiency (short-run success) and effectiveness (long-run success) of critical success factors are equally important, the effectiveness (long-run success) is mainly depends upon the efficiency (short-run success) (Maqbool, 2018).

In the research by Petro and Gardiner (2015), the Project Portfolio Management (PPM) effectiveness and the portfolio success in one global construct is presented. The results support the strong and highly significant correlation between portfolio success and PPM effectiveness (Petro & Gardiner, 2015).

Apart from the work as discussed above, further literatures required to deeply investigated to what extent these two measures of success, PSEF and PSBD, are correlated recently, especially from the PBF's perspective. This is also claimed by other authors that there is little empirical work to investigate this relationship (Serrador & Turner, 2015). An exploratory study is warranted, and this leads to our research hypothesis:

H5a:

Project success-efficiency (PSEF) has a positive influence on project success-business development (PSBD).

3.3 Indicator and measurement

In addition to the understanding of the core concepts generated by the literature review mentioned above, most questionnaires except those of project characteristics were formulated

directly on the basis of previous questions from similar studies in order to draw on existing knowledge (Nevstad et al., 2021). The scale of project characteristics was developed by the author.

3.3.1 Project success

Two types of suppliers were identified by R. Turner and Zolin (2012) identified: the main contractor, the subcontractors or material suppliers. The PBFs in Chinese offshore industry as the main contractor, being the permanent organization and separated from the owner organization, they are the senior management in the lead contractor. They have contract relation with the owner organization. At the end of the project, they should have made a profit from the work. To accomplish this, they are concerned that the work of the project should be completed to time and cost. To maintain their reputation as the main contractor, they will be concerned that the asset will perform as expected according to the specification, and so they will maintain client or investor loyalty. They will be interested in the new competence, technology, capability, and class in the following years and they are more concern about whether the success of this project increases the chance of future projects (R. Turner & Zolin, 2012).

Serrador and Turner (2014) adopt more current terminology about project success from Cooke-Davies (2002), which uses project success—meeting wider business and enterprise goals whereas project efficiency—meeting cost, time and scope goals (Serrador & Turner, 2014) . M. L. Martens and Carvalho (2016) introduced five dimensions of project success (impact on clients, efficiency, direct business and success, impact on team, and preparation for the future). These dimensions of project success are well accepted in project management research (M. L. Martens & Carvalho, 2016).

Therefore, the dependent variable project success was operationalized mainly from the PBFs perspective in Chinese offshore industry, who is both the senior supplier and main contractor. By using the definition of project efficiency and project success by Serrador and Turner (2014) and based on the five dimensions of project success, the measurement construct for project success-efficiency and project success-business development was adopted (Shenhar et al., 2001).

We adapted the scale items of project efficiency and project success from (C. D. P. Martens et al., 2018). Project Success -Efficiency (PSEF) is a four-item scale. Project Success - Business Development (PSBD) has six items (Zhao et al., 2021). The five-point Likert type items (from strongly disagree to strongly agree) measured the combined level of performance, meeting of user requirements, and achievement of project success (added value to business success, made

profit from the project) or efficiency (in terms of time, cost, and functionality achievements). Higher scores indicate higher levels of project success (Müller & Martinsuo, 2015).

Project Success -Efficiency (adapted from C. D. P. Martens et al. 2018)

PSEF1 the project was completed on time or earlier.

PSEF2 the project was completed within or below budget.

PSEF3 the project had only minor changes.

PSEF4 other efficiency measures were achieved.

Project Success - Business Development (C. D. P. Martens et al., 2018)

PSBD_1 The project was an economic business success.

PSBD_2 The project increased the organization's profitability.

PSBD_3 The project has a positive return on investment.

PSBD_4 The project increased the organization's market share.

PSBD_5 The project contributed to shareholders' value.

PSBD_6 The project contributed to the organization's direct performance.

3.3.2 Relational governance

Relational governance is measured by using four facets: trust, and relational norms of solidarity, information exchange and flexibility (Haq et al., 2019). The particular “lived” relationship are assessed, such as acting as if the two parties seeing them as two separate businesses, acting individually and each of them trying to maximize their own utility, or as one entity to implement the project, acting cooperatively trying to maximize both parties’ utility. This may be independent from the behavior attempted by governance (Müller & Martinsuo, 2015). The independent variable of relational governance was operationalized using the measure scale items of Haq et al. (2019). A six-item scale measures the trust. Flexibility is measured by a scale having two items. Solidarity and information exchange were measured by a scale having three items each. These scale questions assessed on a five point Likert scale from completely inaccurate to completely accurate (Haq et al., 2019).

TR: Trust (Haq et al., 2019).

TR1, we believe the other party can keep their word throughout the life of the project.

TR2, we feel confident that the other parties have high levels of integrity and honest.

TR3, we believe the project engineers and other technical people are competent at what they are doing.

TR4, we trust that the project participants are able to fulfill contractual agreements.

TR5, we are certain that the other parties have the ability to perform their tasks.

TR6, we believe that the other parties could meet the requirements of the project in technology and management.

SO: Solidarity (Haq et al., 2019).

SO1 The parties are consistent with the expectations of this project.

SO2 The project's overall plan and the implementation scheme are shared by every party.

SO3 Parties involved in this project regard each other as major partners.

IE: Information Exchange (Haq et al., 2019).

IE1 Exchange of information among the parties takes place frequently.

IE2, we keep each other informed about events or changes that may affect the other parties.

IE3 The parties established a good contact with each other, avoiding possible misunderstandings.

FX: Flexibility (Haq et al., 2019).

FX1, we believed that the parties were willing to cooperate to work out solutions if some unexpected situations arose.

FX2 The parties expected to be able to make adjustments in the ongoing relationship to cope with changing circumstances.

3.3.3 Project governance

Project governance were divided by APM (2004) into four main dimensions consisting of: 1) portfolio direction-effectiveness and efficiency, 2) project management-effectiveness and efficiency, 3) project sponsorship-effectiveness and efficiency, and 4) disclosure and reporting-effectiveness and efficiency (APM, 2004). In 2011, APM renamed the one dimension as project management capability from project management effectiveness and efficiency (Sirisomboonsuk et al., 2018).

The UK's Association for Project Management's their standard on project governance titled 'Directing Change: A Guide to Governance of Project Management' (APM, 2004). This 'standard' stated instead a set of principles and guidelines, does not go into any detail as to governance processes, structures, or procedures. Principally, governance is seen as an oversight function and the publication defines the governance of project management as:

"The governance of project management concerns those areas of corporate governance that are specifically related to project activities. Effective governance of project management ensures that an organization's project portfolio is aligned to the organization's objectives, is delivered efficiently and is sustainable. Governance of project management also supports the means by which the boards, and other major project stakeholders, are provided with timely,

relevant and reliable information” (APM, 2004).

UK’s APM’s guide to project governance defines 11 principles of good project governance: "1) The board has overall responsibility for governance of projects. 2) The roles, responsibilities, and performance criteria for the governance of project management are clearly defined. 3) Disciplined governance arrangements, supported by appropriate methods and controls, are applied throughout the project life cycle. 4) A coherent and supportive relationship is demonstrated between the overall business strategy and the project portfolio. 5) All projects have an approved plan containing authorization points at which the business case is reviewed and approved. Decisions made at authorization points are recorded and communicated. 6) Members of delegated authorization bodies have sufficient representation, competence, authority, and resources to enable them to make appropriate decisions. 7) The project business case is supported by relevant and realistic information that provides a reliable basis for making authorization decisions. 8) The board or its delegated agents decide when independent scrutiny of projects and project management systems is required and implement such scrutiny accordingly. 9) There are clearly defined criteria for reporting project status and for the escalation of risks and issues to the levels required by the organization. 10) The organization fosters a culture of improvement and of frank internal disclosure of project information. 11) Project stakeholders are engaged at a level that is commensurate with their importance to the organization and in a manner that fosters trust” (Knapp, 2018).

Based on the principles for the governance of project management developed by APM (2004) as well as APM (2011), Musawir et al. (2017) developed a scale for effective project governance (EPG). The principles summarize the governance of the project management function into succinct statements, and it is easy for the measurement on a Likert-type scale. They were adapted to apply to individual projects, although the principles were originally meant to apply to the entire project management function within an organization. Additional items were also identified in accordance with the academic literature by Musawir et al. (2017). The final EPG scale consists of 9 items (Musawir et al., 2017).

Our study operationalizes project governance from the project owner’s perspective using the Musawir et al. (2017) set of nine semantic-difference type questions on a five-point scale.

Project governance (Musawir et al., 2017)

PG1 The management board had overall responsibility for project governance

PG2 Disciplined governance arrangements were applied throughout the project life cycle

PG3 Roles and responsibilities for project governance were defined clearly

PG4 The project's business case was supported by relevant and realistic information that

provided a reliable basis for making authorization decisions

PG5 There were clearly defined criteria for reporting project status and for the escalation of risks and issues to the relevant organizational levels

PG6 Decisions made at authorization points were recorded and communicated to the relevant stakeholders

PG7 The project had a project owner who was the single point of accountability in and to the organization for realizing project outcomes and benefits

PG8 The project had a project manager who was accountable to the project owner for achieving project objectives and deliverables

PG9 The organization fostered a culture of frank internal disclosure of project management information

3.3.4 Opportunism

Opportunism, is conceptualized as the extent to which the partnering firm blatantly violates the contract and fail to fulfill its obligations or commits apparently illegal and unethical behaviors. Opportunism is measured with four items adopted originally from Um and Kim (2018).

Opportunism(Um & Kim, 2018)

OP1: the partnering firm exaggerates needs to get what it desires.

OP2: the partnering firm breaches formal or informal agreements to its benefit.

OP3: the partnering firm slightly alters facts to get what it wants.

OP4: good faith bargaining is not a hallmark of this firm's negotiation style.

3.4 Research method

The research used in this study is characterized as both combined the explanatory and confirmatory seeking to explain project success through various project factor variables. A survey research model for collecting quantitative data was adopted together with professionals responsible for projects in PBFs operating in offshore industry in China selected through convenience non-probability and snowball sampling. Except the scale development for project characteristics by the author, the other research instrument was some questionnaires based on or adapted from previous studies. Most closed questions used 5 point Likert scales (Lopes, 2015; C. D. P. Martens et al., 2018).

3.4.1 Selection of offshore industry as empirical base

Project-based firms (PBFs) in offshore industry are often involved in multi-partner projects of high complexity. Furthermore, PBFs often have significant influence on the productivity and growth of related industries in the supply chain and act in international markets because they act as facilitators in the offshore business-to-business market. Therefore, a study of multi-partner projects involving PBFs has the potential to bring significant value to research and practice of offshore industry as well as similar industries, such as infrastructure construction, other EPC type heavy industries. Chinese PBFs in offshore industry are almost entirely state-owned enterprises (SOEs) except a few private companies. It is well known that such SOEs play an important role in growth, development, and innovation in many industries. In sum, the PBF in offshore industry provide a highly appropriate setting, as their main business model is multi-partner projects in which the participants are specialized in different knowledge areas. Thus, this industry has been selected as the research's empirical base (Nevstad et al., 2021).

The surveys were conducted using a quantitative method. Our quantitative data were collected through the surveys carried out in the Chinese offshore industry. Our interest was in on-going and the finished multi-partner projects measuring project-level project efficiency and firm-level project success, as well as the factors toward the project success, which includes the project characteristics, opportunism, project governance and relation governance. The surveys were carried out in the respective native languages.

3.4.2 Research steps

The main objective of this study is to identify the relationship between project success and project characteristics, opportunism, project governance, relational governance by executing a quantitative data analysis in offshore industry of China. This study consists of a total of five steps.

Firstly, an intensive literature review was conducted to identify the project success indices used in this study and the various project characteristics, the opportunism, project governance and relational governance (together as project factor variables) that affect such indices and that are often used to measure the possibility of the success of an offshore project. The various project factor variables and project success indices that were used in this study were selected through this intensive literature review and their definitions were also presented.

Secondly, the data collection includes pilot questionnaire and main survey. For the pilot study, we firstly distribute the electronic version of the preliminary questionnaire scale to 8

members of the Expert Panel. Each recipient in this pilot study was asked to complete the survey and to forward it to other persons in leading positions or have the project management expertise in their own network, especially in the offshore industry are preferred. This snowball sampling technique should increase the number of responses within sectors by invitation of others through their peers.

Thirdly, a factor analysis of the project factor variables (or observed variables) affecting the project success was performed to deduce the exogenous variables that comprised the SEM model. Six exogenous variables were deduced from such factor analysis. In addition to the exogenous variables, the hypothetical model was developed based on the various project factor variables and project success indices that were selected in the first step.

Fourthly, the developed hypothetical model was continuously revised so that it could best explain the causal relationship between project success and various project factor variables. After developing the revised model, various GOF measures were made, and the level of appropriateness of the model was verified. As a result, a SEM was developed that can explain the causal relationship between various project factor variables and project success indices, and the degrees of influence of such project factor variables on project success.

Finally, using the developed SEM, the relationship between the various project factor variables and project success was explained, and the causal relationship between them was examined, and the research results were presented to CA Company as practice test (Cho et al., 2009)c.

3.4.3 Data collection

The data collection includes pilot questionnaire and main survey. Pilot questionnaire is conducted with snowball sampling for the scale development of project characteristics (PC). The main survey further divided into two parts. The main survey involved the top management related to offshore business, project managers and project professionals of project team mainly from five PBFs engaging offshore business in China, as well as the online survey data got from the network of offshore industry in China.

Pilot questionnaire is conducted for the scale development of project characteristics (PC). For the pilot study, we firstly distribute the electronic version of the preliminary questionnaire scale to 8 members of the Expert Panel. Each recipient in this pilot study was asked to complete the survey and to forward it to other persons in leading positions or have the project management expertise in their own network, especially in the offshore industry are preferred. This snowball sampling technique should increase the number of responses within sectors by

invitation of others through their peers. While the drawback was that we could not track the number of forwards to other respondents, the snowball sampling was efficient, as it revealed 201 complete responses during the pilot questionnaire phase.

First part of the main survey, a total of 65 top management, project managers or program project professionals from the key player COBs in the offshore industry were invited to participate in the questionnaire survey. After telephone discussion with them, we presented the questionnaire to them, and finally received 51 completed questionnaires, so the response rate of first part main survey was about 76% (R. Turner & Zolin, 2012).

Thereafter, an online questionnaire tool (Tencent questionnaire online) of the second part main survey was used and distributed with Wechat by the author's network and ask the recipients to complete the survey and to distributed it online in their own network again. This snowball sampling technique should increase the number of responses within sectors by invitation of others through their peers. While the drawback was that we could not track the number of forwards to other respondents. The snowball sampling was efficient, as it received 236 responses; we excluded the invalid responses and revealed 207 complete responses from the snowball sampling, together with the responses from the first part, total 258 complete responses during the main survey phase.

During the second part of the main survey, respondents were selected by using the web databases of project professionals and web social networks, especially Wechat. All respondents of our research were from Chinese organizations. The survey link was sent to potential respondents working in project management. As a way of ensuring the sample profile, the first question of the questionnaire was whether the respondent acts in the project management of offshore industry or academic. If the answer was: (i) negative, the questionnaire was terminated; (ii) affirmative, the other questions were completed. Initially, a pre-test was developed with the members of Expert Panel. Its results were used only for the purpose of evaluating the questionnaire developed (C. D. P. Martens et al., 2018).

3.4.4 SEM and analysis/discussion

SEM is a multivariate analysis method that was developed to examine causal relationships in the social sciences, which use mainly quantitative analysis. Similar to multiple-regression equations, SEM analyzes the structure of the interrelationship expressed as a series of arithmetic equations (Cho et al., 2009).

Thereafter, the findings from the data analysis and the hypothesis will be tested. At this stage, the research results will be presented to CA Company for verify. Implications for

academy and practice are proposed thereafter. This will contribute to the theory gap of the project success and related governance theory within Chinese context as well as the practices. Moreover, problems that occur with the PBFs on the offshore projects are faced by other Chinese construction company who are securing infrastructure projects overseas by investing on the project or providing a similar heavy tail payment term. A numbers of non-successful infrastructure projects rapidly changed the public perception of the overseas project engaged by the Chinese construction companies.

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Chapter 4: Scale Development of PC

There is a lack of an operationalization and measurement scale for project characteristics (PC) suitable for the study of Chinese offshore industry in the literature. To address this gap, this study developed a scale for PC (Musawir et al., 2017). We reviewed the elements as well as the questionnaire of PC from the current literatures to develop reliable measures of PC to identify the relevant factors toward project success. Although some of the items in the scales had been previously tested by research, there was no certainty that the project stakeholders' assessment of the PC forms a reliable scale (R. Turner & Zolin, 2012).

Although the number of these steps is claimed in different sources to vary with respect to the details of the actions to be taken, the development of a scale can follow the similar process and procedures (Çoklar et al., 2017; Kump et al., 2018; R. Turner & Zolin, 2012). In developing new scales and the questions used to measure PC, we followed DeVellis's eight steps for scale development (DeVellis, 2012). The goal of the factor analysis was to condense the large number of items into a smaller number of reliable scales. Our aim was to develop one scale for project characteristics. The survey contained a larger number of items that are relevant to the content of interest so it can function as a rich source from which scales can emerge. In our study, a 5-point Likert scale was employed (R. Turner & Zolin, 2012). Below is presented the details of these steps explaining the process of scale development.

4.1 Building the conceptual framework

4.1.1 Building the conceptual framework phase

The related literature is limited in terms of project characteristics (PC); therefore, the conceptual framework is limited as well. For literature review of the studies on PC, our items should focus on the general existence of project characteristics other than project management asset characteristics. We considered to start from the existing scales, and then combined them into one new instrument that measures all the aspects of PC. As Different interpretations (and implicit definitions) of the PC dimensions were employed by the different authors, we realized that a mere combination of subscales from different instruments is not feasible. The scale development requires (i) homogeneous phrasing of the items in the different subscales with a focus on the actual presence of capacities. And (ii) refined operationalization of PC.

Nevertheless, our aim was that the new scale builds on existing scales as much as possible (Kump et al., 2018).

The study conducted by Ling et al. (2004) presented the project characteristics (Table B.1 of Annex B) affecting project performances, which were divided into three categories: (i) project characteristics, (ii) owner and consultant characteristics, and (iii) the contractor characteristics (Ling et al., 2004). The various characteristics that affect project performance, based on the analysis of previous research, can generally be categorized into the characteristics of the project, the project participants, and the market. Among the various characteristics that were used in the previous research, those that were used in this paper were selected based on the following two criteria: (1) the characteristics that were used in the previous difference literatures and researches; and (2) data regarding the characteristics can be obtained or collected for this study (Cho et al., 2009).

4.1.2 Item pool phase

During the process of generating items based on the criteria obtained from the literature review conducted by the researcher, 18 items were generated after considering that some of those statements shouldn't be evaluated within the context of offshore project, and some of those should be stated more generally and be combined.

Project Environment Characteristics

X1 Project scale

X2 Time given to contractors to prepare bid

X3 Type of project

X6 Project scope definition completions when bids are invited

X8 Level of design preparation by owner or third party

X10 need under the charting contract with low uncertainty

X7 Flexibility of work scope

Project Contractor's Characteristics

X4 Level of project complexity

X5 Whether repeat order

X9 The project goals and terms could be changed if conditions made it necessary

X15 Contractor's capability and Communication among project team members

X16 Contractor's paid-up capital

X17 Contractor's track record for the offshore project

Project Owner's Characteristics

X11 Owner's capability for project management

X12 Owner's administrative burden

X13 Owner's experience with similar projects

X14 Owner's level of control over the design changes

X18 Owner's resource (incl. funding) commitment

4.2 Content validity by expert

4.2.1 Expert panel (EP)

In order to consult the experts for the conceptual of PC as well as content validity, a panel of experts was organized (DeVellis, 2012). The panel comprised eight experts: (i) one professor and one PhD in project management, (ii) two professionals from offshore industry, which include the author, (iii) two professionals from infrastructure industry, (iiii) one professor and one PhD in infrastructure,

To verify the conceptual framework for PC, the members of the EP were asked for their opinions on the conceptual framework for PC. An open-ended question form (Form for what project characteristics accounted for the project success) was utilized accordingly. Content analysis method, which is qualitative data analysis method, was employed for the analyses of the obtained data.

4.2.2 Content validity by expert review

Following item pool generation step, the scale developed was presented to the members of EP for review. In addition, these experts were provided with literature review on PC, and some documents on the purpose of the present research. The experts were requested to rate the importance of each item on a scale of "not necessary", "useful, but not essential", and "essential" (Musawir et al., 2017).

The review was conducted in a face to face or telephone interview format. The questionnaire was refined based on the comments received, and the experts' opinions addressed item elimination focused on redundancy, content ambiguity, correlation, and scale representativeness of the construct. The expert review resulted in a list of 15 items, 5 items corresponding to the dimension Project Environment Characteristics (EC), 6 items to Project Contractor Characteristics (CC) and 4 items to Project Owner's Characteristics (OC). The

refined list was used to develop a scale for testing in the pilot questionnaire in the next stage (Alvarado-Herrera et al., 2017).

Project Environment Characteristics

X1 Project scale

X3 Type of project

X6 Project scope definition completions when bids are invited

X8 Level of design preparation by owner or third party

X10 Time given to contractors to prepare bid

Project Contractor characteristics

X4 Level of project complexity

X5 whether repeat order

X9 The project goals and terms could be changed if conditions made it necessary

X15 Contractor's capability and Communication among project team members

X16 Contractor's paid-up capital

X17 Contractor's track record for the offshore project

Project Owner's Characteristics

X11 Owner's capability for project management

X13 Owner's experience with similar projects

X14 Owner's level of control over the design changes

X18 owner's resource (incl. funding) commitment

4.3 Pilot questionnaire of PC

4.3.1 Pilot questionnaire phase

Pilot questionnaire phase of PC was conducted. For the pilot study, we firstly distribute the electronic version of the preliminary scale to members of the EP. Each recipient in this pilot study was asked to complete the survey and to forward it to other persons in leading positions or have the project management expertise in their own network. This snowball sampling technique should increase the number of responses within sectors by invitation of others through their peers. While the drawback was that we could not track the number of forwards to other respondents, the snowball sampling was efficient, as it revealed 201 complete responses during the pilot questionnaire phase (Kump et al., 2018).

A pre-test using the above mentioned and developed scale was conducted, and data

collected accordingly. Thereafter correlation analysis was carried out to remove unsatisfactory items.

Using IBM SPSS, the Cronbach α of three dimensions of PC are calculated, and then the CITC of each item of three dimensions of PC is computed. The results are presented in Table B.2 of Annex B. Furthermore, Item X1 and X4 are to be deleted because its CITC value is below the threshold of 0.5.

After the removal of Item X1 and X4, data in Table 4.1 reveal that the Cronbach α of the three dimensions of the PC are 0.844, 0.874 and 0.832, and all these figures are above the statistically acceptable threshold of 0.7 (DeVellis, 2012). This means that the PC of project can reliably and accurately be measured through this scale.

Table 4.1 Reliability Analysis of the updated Scale Measuring PC

Variables	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Project Environment Characteristics	X3	0.528	0.474	0.844
	X6	0.608	0.423	
	X8	0.551	0.447	
	X10	0.574	0.442	
Project Contractor characteristics	X5	0.545	0.694	0.874
	x9	0.683	0.658	
	X15	0.641	0.664	
	X16	0.688	0.651	
	X17	0.65	0.664	
Project Owner's Characteristics	X11	0.709	0.766	0.832
	X13	0.673	0.783	
	X14	0.629	0.802	
	X18	0.634	0.8	

4.3.2 Exploratory factor analysis of pilot questionnaire

Exploratory factor analysis was used to reduce the number of items based on the data from pilot questionnaire phase. Cronbach's alpha was used to ascertain the reliability and construct validity of the scales. Questions that detract from the Cronbach's alpha measure of the scale, or those that do not load optimally on the scale's factor, were dropped from the scale. Our cutoff was an alpha of 0.70. We conducted a rotated Varimax factor analysis using all success factor items. These analyses were conducted using Eigenvalues greater than 1. We then took each factor and tested to ensure they loaded on one factor and, if so, calculated the Cronbach's alpha. Where a scale loaded on more than one factor, we tested the loadings and Cronbach's alpha for each subscale (R. Turner & Zolin, 2012).

For the 'purification' of items to make the questionnaire more reasonable and reliable, Principal Component Analysis (PCA) is carried out on every item to find out whether the scales

measuring PC are within the same dimensionality. The KMO value of PC was 0.938, and it passed Bartlett's test of sphericity ($p\text{-value} < 0.001$) to explain that the data obtained from the pretest could be used for PCA.

In view of the data in Table B.3 of Annex B, the eigenvalues of the three factors of the PC are above 1.0, and their cumulative proportions of variance explained are 67.664%, which denotes that they have adequate capability to explain. The above results also mean that the numbers of factors of PC are in line with the initial division of their structures.

Using PCA and Varimax, the following data were obtained as shown in Table B.4 of Annex B. The PCA results of PC show that Item X5 has factor loadings of 0.592 on Project Contractor Characteristics, and this item is thus removed. The PC has three dimensions, namely EC (Project Environment Characteristics), CC (Project Contractor characteristics), and OC (Project Owner's Characteristics), and other items show convergence on these factors: X9, X15, X16 and X17 on CC, X3, X6, X8 and X10 on EC, X11, X13, X14, and X18 on OC.

During the pilot questionnaire phase, multiple statistical methods are used to 'purify' the items regarding PC, and finally 12 items were obtained, as are shown in following list.

Project Environment Characteristics

X3 Type of project

X6 Project scope definition completions when bids are invited

X8 Level of design preparation by owner or third party

X10 need under the charting contract with low uncertainty

Project Contractor characteristics

X9 The project goals and terms could be changed if conditions made it necessary

X15 Contractor's capability and Communication among project team members

X16 Contractor's paid-up capital

X17 Contractor's track record for the offshore project

Project Owner's Characteristics

X11 Owner's capability for project management

X13 Owner's experience with similar projects

X14 Owner's level of control over the design changes

X18 Owner's resource (incl. funding) commitment

4.4 Main survey

Two parts of main survey was conducted. Firstly, the study involved the top management related

to offshore business, project managers and project professionals of project team from PBFs engaging offshore business in China. Secondly, an online survey tool was used and distributed by the author's network and ask the recipients to complete the survey and then to distributed it online in their own network again.

Then, Exploratory Factor Analysis (EFA) for the construct validity was carried out to present factor construct of the scale; and item validity in order to present the item discrimination index of each item, were conducted. Thereafter internal consistency coefficient (Cronbach Alpha) was conducted to test reliability for PC.

Data collected to develop the scale were analyzed in SPSS (Statistical Package for the Social Sciences), and confirmatory factor analyses (CFA) were conducted in AMOS programs (Çoklar et al., 2017).

4.4.1 Item reliability of PC

In order to confirm item reliability, this study used Cronbach's alpha, composite reliability and items' loadings (Soltani, 2020). The reliability of our scales was assessed through Cronbach's alpha. The values of both measures were found to be >0.7 for all the scales, suggesting good internal consistency (Trada & Goyal, 2020). After the questionnaires are collected, the Cronbach α indices of each dimension of PC as well as the CITC (Corrected Item-Total Correlation) of each item are computed. The results are shown in Table 4.2.

Table 4.2 Reliability Analysis of the Scale Measuring PC of main survey

Variable	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Project Owner Characteristics	X11	0.626	0.761	0.809
	X13	0.629	0.758	
	X14	0.689	0.731	
	X18	0.569	0.791	
Project Environment Characteristics	X3	0.574	0.8	0.816
	X6	0.65	0.764	
	X8	0.705	0.735	
	X10	0.624	0.774	
Project Contractor Characteristics	x9	0.58	0.749	0.789
	X15	0.656	0.708	
	X16	0.662	0.704	
	X17	0.502	0.782	

4.4.2 EFA of PC

During the main survey stage, an Exploratory Factor Analysis (EFA) was conducted specifically again for the newly developed PC scale to identify the latent factors of the construct. As shown in Table B.5 of Annex B, the PCA results of PC show that Item X17 has factor loadings of 0.525

and 0.595 on CC and OC respectively, and this item is thus removed in that the two values are above 0.5 (cross-factor loading).

As showed in Table B.6 of Annex B, the EFA was conducted again, the Item X3 and X18 have factor loadings on CC which they should not have factor loadings on this dimension of PC, so the Item X3 firstly is removed and the EFA was conducted again.

After that, as showed in Table B.7 of Annex B, the PCA results of PC show that Item X18 has factor loadings of 0.522 and 0.504 on CC and OC respectively, and this item is thus removed.

Thereafter, the EFA was conducted using Principal Components Analysis and Promax rotation with Kaiser Normalization (Table 4.3). The Kaiser-Meyer-Olkin (KMO) test and Barlett's test of sphericity for the PC scale in (Nunnally, 1978) dictated results (0.895, p-value b 0.001) well above the recommended threshold of 0.6 (Kaiser, 1974) and p-value b 0.05. This suggests that the data are suitable for structure detection. A cut-off points of 0.35 was used for the EFA factor loadings based on the recommendations of (Hair, 2010). None of the items loaded below this threshold (Musawir et al., 2017).

Table 4.3 Main Survey final PCA Results of PC

Items	Principal Components		
	1	2	3
X16	.825		
X15	.721		
x9	.708		
X17	.603		
X13		.795	
X14		.780	
X11		.732	
X6			.823
X10			.742
X8			.722

4.4.3 CFA of PC

Subsequently, a Confirmatory Factor Analysis (CFA) was conducted to test the convergent and discriminant validities of all the constructs in the model. Discriminant Validity signifies whether significant difference exists between latent variables, and the results of Convergent Validity show whether the same latent variable can be measured by the different observed variables. All items loaded onto their respective constructs with loading values greater than the acceptable threshold of 0.50. As shown in Figure B.1 of Annex B, the loading values of X17 is only 0.37, so the Item X17 will be removed (Musawir et al., 2017)c.

After removing Item X17, CFA of data collected is performed again using AMOS to test the convergent validity of the scales measuring PC. The results are displayed in Figure B.2 of

Annex B.

The results in Table B.8 of Annex B show that for the three dimensions constituting PC, their χ^2/df indices are between 1.2 and 1.5, and AGFI, CFI, GFI, and TLI, are all above 0.9, RMR is less than 0.05 and RMSEA is less than 0.08. These figures denote goodness of fit (GOF) of the CFA model and data collected.

Convergent validity measures the correlation between different items within the same dimension, and it can be represented by the standardized factor loading and mean variance extraction of the items. To test the convergent validity of the scales measuring PC, we performed CFA. The convergent validity and mean variance extractions (AVE) of PC is displayed in Table B.9 of Annex B.

Table B.9 of Annex B shows that the standardized factor loadings of the observed variables are higher than the recommended minimum threshold of 0.7 in statistics. As far as composite reliability is concerned, the indices for the three latent variables in PC are 0.800, 0.783 and 0.793 respectively, and all are above the commonly accepted threshold of 0.6. The VAE results of 0.571, 0.546 and 0.561, which are all more than 0.5, indicate satisfied convergent validity of the model measuring PC.

After the main survey, a list of 12 items for PC is remained, 3 items corresponding to the dimension Project Environment Characteristics (EC), 3 items to Project Contractor Characteristics (CC) and 3 items to Project Owner's Characteristics (OC). The refined list is as following:

Project Environment Characteristics

X6 Project scope definition completions when bids are invited

X8 Level of design preparation by owner or third party

X10 need under the charting contract with low uncertainty

Project Contractor characteristics

X9 The project goals and terms could be changed if conditions made it necessary

X15 Contractor's capability and Communication among project team members

X16 Contractor's paid-up capital

Project Owner's Characteristics

X11 Owner's capability for project management

X13 Owner's experience with similar projects

X14 Owner's level of control over the design changes

4.5 Chapter summary

In this chapter, first the literature review and expert consulting are used to build the conceptual model of PC. In the two phases of data sampling—pilot questionnaire and main survey, PCA is performed for the data collected, and CFA is carried out on the information retrieved in both phases. The three dimensions which constitute PC are proposed and confirmed after these two phases of data collecting and processing. Results of this empirical study prove that PC has three dimensions, namely Project Owner Characteristics, Project Environment Characteristics, and Project Contractor Characteristics. Both the results of PCA and the results of CFA support this three-dimensional PC model, and the scale also has satisfactory reliability and validity.

The structure of the PC built and confirmed in this study exhibits difference from that summarized from the previous literature review. The scale in this research is exclusively developed for offshore project in China according to their characteristics, which makes it more industry-specific compared to other scales.

Also, for the PC scale, the CFA results corroborate the EFA results. Altogether, the results provide evidence for the convergent, construct validities discriminant and consequently, of the constructs. Furthermore, all constructs had Cronbach's alpha values above the recommended threshold of 0.7 (Nunnally, 1978), thus providing evidence for the reliability of the constructs (Musawir et al., 2017)c.

Chapter 5: Findings and Analysis

5.1 Population, sample, and sampling technique

During the main survey phase, 258 valid questionnaires were received. In this sample, most of the respondents were male (76.7%), possess a bachelor's degree (34.5%) and worked between 6-10 years (35.3%)(Luo et al., 2017). Details are given in Table 5.1.

Table 5.1 Respondents' demographic.

Characteristics	Category	Frequency	Percentage
Gender	Male	198	76.70%
	Female	60	23.30%
Education	Ph.D.	51	19.80%
	Master's degree	74	28.70%
	Bachelor's degree	89	34.50%
	Others	44	17.10%
Work experience	≤5years	42	16.30%
	6–10 years	91	35.30%
	11–20 years	87	33.70%
	>20 years	38	14.70%
Designation	Project/Depts. manager	59	22.90%
	Professional Academy	65	25.20%
	Project engineer, project team member	87	33.70%
	Others	47	18.20%
Project type	Jack up project	122	47.30%
	Semi-sub project	70	27.10%
	FPSO/FSRU project	38	14.70%
	Others	28	10.90%
Project size	≤100 million USD	42	16.30%
	100–300 million USD	93	36.00%
	300–500 million USD	88	34.10%
	>500 million USD	35	13.60%
Project duration	≤12 months	44	17.10%
	13–24 months	72	27.90%
	25–36 months	93	36.00%
	>36 months	49	19.00%

5.2 Reliability-internal consistency

The same standard procedures adopted in the previous internal consistency tests for PC scale development were utilized again, and the main indicators are still CITC and Cronbach α .

The reliability and validity of PC have already been tested in Chapter 4, and now those of Project Governance, Opportunism, Relation Governance and Project Success will be examined. The CITC and Cronbach α indices of scales for Project Governance, Opportunism, Relation

Governance and Project Success are presented as following.

5.2.1 Project governance

SPSS statistical software is used to analyze the reliability of project governance. The results are shown in Table C.1 of Annex C. In general, Cronbach's "a" of project governance is significantly greater than 0.7 (the minimum value is 0.917), all values in the column "Cronbach Alpha if item dropped" of each item are less than the current value of Cronbach Alpha of PG, and the CITC value of all items is significantly greater than the evaluation standard of 0.5, so all items can be retained to achieve "very reliable" Therefore, the reliability of the measurement scale of project governance is high.

5.2.2 Opportunism

SPSS is used to analyze the reliability of opportunism (OP). The main results are shown in Table C.2 of Annex C. It can be seen the Cronbach's Alpha of the initial relationship, the CITC of all items is greater than 0.5. In addition, for each variable, the Cronbach's a value of the measurement model is less than that of the initial measurement model after deleting any measuring item, so the opportunistic measurement scale has high reliability.

5.2.3 Relation governance

SPSS is used to analyze the reliability of the four dimensions of relationship governance, including Trust (TR), Information Exchange (IE), Solidarity (SO) and flexibility (FX). The results are shown in Table C.3 of Annex C. In general, Cronbach's "a" of TR, IE, SO and FX is significantly greater than 0.7 (the minimum value is 0.74), the CITC value of all items is significantly greater than the evaluation standard of 0.5, and all values in the column "Cronbach Alpha if item dropped" of each item are less than the current value of Cronbach Alpha of each sub-dimension (TR, IE, SO and FX), so each item can be retained to achieve Therefore, the reliability of the scale of trust, communication, stability and flexibility is high.

5.2.4 Project success

SPSS is used to analyze the reliability of project success, including project efficiency (PSEF) and project business development (PSBD). The results are shown in Table C.4 of Annex C. In general, Cronbach's "a" of PSEF and PSBD is significantly greater than 0.7 (the minimum value is 0.833). All values in the item "Cronbach Alpha if item dropped" of each item are less than

the value of the original scale, and the CITC value of all items is significantly greater than the evaluation standard of 0.5, and each item can be retained, Achieve a "very credible" level. Therefore, the reliability of the measurement scale measuring process management performance and project result performance is high.

The Cronbach Alpha of each variable analyzed in Section 5.2 are illustrated in Table 5.2.

Table 5.2 Reliability Test of scale for the variables

Variable	Cronbach Alpha
Project Governance (PG)	0.927
Opportunism (OP)	0.814
Relation Governance-Trust (TR)	0.883
Relation Governance-Information Exchange (IE)	0.833
Relation Governance-Solidarity (SO)	0.819
Relation Governance-Flexibility (FX)	0.74
Project Success-efficiency (PSEF)	0.833
Project Success-business (PSBD)	0.904

5.3 Convergence validity analysis

Thereafter, we performed a confirmatory factor analysis (CFA) to evaluate the convergent validity of Project Governance, Opportunism, Relation Governance and Project Success, where the convergent validity of PC have already been tested in Chapter 4, to confirm that the loadings of scale items on the corresponding variables are statistically significant and >0.6 (Trada & Goyal, 2020).

5.3.1 Project governance

The measurement model and results of confirmatory analysis of project governance are shown in Figure C.1, C.2 of Annex C and Table C.5, C.6 of Annex C respectively. As shown in the Figure C.1 and Figure C.2 of Annex C, Item PG2 is removed to improve the construct fit.

As Table C.5 of Annex C, the test shows that $CMIN / DF < 3$, $RMSEA < 0.05$, $RMR < 0.05$, the values of GFI, NFI, IFI, TLI, CFI and AGFI are greater than 0.9, and the AIC and CAIC of the preset model are less than the corresponding values of saturation model and independent model.

Table C.6 of Annex C shows that the standardized factor loadings of the observed variables are between 0.727 and 0.802, and all are higher than the recommended minimum threshold of 0.7 in statistics. As far as composite reliability of project governance is 0.921 (>0.6). The mean variance extraction of them is 0.593, which are also all above the minimum requirement of 0.5. These results indicate that the model measuring project governance has satisfactory convergent

validity.

5.3.2 Opportunism

The measurement model and results of opportunistic confirmatory analysis are shown in Figure C.3 of Annex C.

Tables C.7 and C.8 of Annex C respectively shows that $RMSEA < 0.05$, $RMR < 0.05$, the values of GFI, NFI, IFI, TLI, CFI and AGFI are greater than 0.9, and the AIC and CAIC of the preset model are less than the corresponding values of saturation model and independent model. The fitting of confirmatory factor analysis model is good. The first-order standardized factor load of all potential variables and their corresponding items is significantly greater than 0.7, the AVE of all potential variables is greater than 0.5, and the combined reliability CR value is much greater than 0.6, which indicates that opportunism has good convergent validity.

5.3.3 Relation governance

Project relation governance can be measured by trust (TR), information exchange (IE), Solidarity (SO) and flexibility (FX). The measurement model and results of confirmatory analysis of potential variables are shown in Figure C.4 of Annex C and Tables C.9, C.10 of Annex C respectively.

The convergent validity of relation governance displayed in Table C.9 of Annex C, shows that the standardized factor loadings of the observed variables are between 0.724 and 0.829, and all are higher than the recommended minimum threshold of 0.7 in statistics. As far as composite reliability is concerned, the values for the 3 latent (except FX) variables in relation governance are 0.835, 0.821, and 0.884 respectively, and all are above the commonly accepted threshold of 0.6. The mean variance extractions of them are 0.628, 0.604, and 0.559, which are more than the minimum standard 0.5. These results indicate that the model measuring relation governance has satisfactory convergent validity

The test shows (Table C.10 of Annex C) that $\chi^2 / DF < 2$, $RMSEA < 0.05$, $RMR < 0.05$, the values of CFI, GFI, IFI, NFI, TLI, and AGFI are greater than 0.9, and the AIC and CAIC of the preset model are less than the corresponding values of the saturation model and the independent model, the fitting of confirmatory factor analysis model is good.

5.3.4 Project success

Project success can be measured by project efficiency (PSEF) and project success- business

development (PSBD). The measurement model and results of confirmatory analysis of potential variables are shown in Figure C.5 of Annex C.

Table C.11 of Annex C shows that $CMIN / DF < 3$, $RMSEA < 0.05$, $RMR < 0.05$, the values of GFI, NFI, IFI, TLI, CFI and AGFI are greater than 0.9. The fitting of confirmatory factor analysis model is good. The first-order standardized factor loading of all potential variables and their corresponding items is significantly greater than 0.7, the AVE of all potential variables is greater than 0.5, and the combined reliability CR value is far greater than 0.6, which indicates that each dimension of project success has good convergence validity.

The measurement model and results of confirmatory analysis of the PSBD dimension of project success are shown in Figure C.6 and Figure C.7 of Annex C. As shown, item PSBD2 is removed to improve the construct fit.

Table C.12 of Annex C shows that the standardized factor loadings of the observed variables are between 0.724 and 0.81, and all are higher than the recommended minimum threshold of 0.7 in statistics. As far as composite reliability of project business development (PSBD) is 0.884, and all are above the commonly accepted threshold of 0.6. The mean variance extraction of them is 0.605, which are also all above the minimum requirement of 0.5. These results indicate that the model measuring project governance has satisfactory convergent validity.

5.4 Exploratory factor analysis (EFA)

5.4.1 EFA of variables

To ensure the single dimensionality and the discriminant validity of each dimension, four principal component analyses (PCA) were carried out on the five sets of items measuring Project Governance, Opportunism, Relation Governance and Project Success.

Data in Table C.13 of Annex C show the number of PCs extracted for each set of items, the proportion of variance explained by the retained PCs, the KMO values and p-values for the Bartlett's Test of Sphericity. Proportions of explained variance are acceptable and vary between 0.64 and 0.71. $KMO > 0.8$ and $p\text{-values} < 0.01$, both showing data are adequate for application of PCA. To make interpretation of principal components easier, the Varimax rotation method was carried out. Loadings after Varimax rotation are shown in Tables C.13, C.14, C.15, C.16, C.17, C.18 and C.19 of Annex C.

Results in Tables C.13, C.14, C.15, C.16, C.17, C.18 and C.19 of Annex C show factor

loadings above 0.5, and there is no cross-loading on factors.

5.4.2 Common method bias

In this study, we used several measures to safeguards against Common method bias (CMB), which is a serious issue for the interpretation of results in survey-based studies. First, we announced that respondents must mark the responses to the best of their knowledge and there were no correct or incorrect answers. Further, we assured key informants that their anonymity would be protected and therefore, alleviating the evaluation apprehension that they may have. Third, we refined our survey items through field interviews in the research design stage and pre-test to reduce ambiguity and enhance understanding of our constructs. Finally, we performed factor analysis on the items related to dependents and independents variables. Our analysis suggests that no single factor represents most of the variance in the samples. Overall, we conclude that common method bias was not a problem in our sample (Trada & Goyal, 2020). Also, related post-hoc tests included the Harman test, which showed 11 factors, with the first one accounting for 36% of the variance, followed by 6%, 5%, 3%, and smaller (Table 5.3). No single factor dominated the test (more than 50%), thus no indication of CMB (Müller et al., 2017).

Table 5.3 Principal Components, Eigenvalues, and Proportions of all variables

Principal Components	Eigenvalues	Proportions of Variance Explained %	Cumulative Proportions of Variance Explained %
1	16.087	36.561	36.561
2	3.074	6.987	43.548
3	2.537	5.766	49.314
4	1.628	3.701	53.014
5	1.436	3.265	56.279
6	1.410	3.205	59.484
7	1.137	2.583	62.067
8	1.048	2.381	64.448
9	.906	2.059	66.507
10	.883	2.007	68.514
11	.784	1.781	70.296

5.5 SEM Model development and validation

5.5.1 Model modification

The SEM was established (Figure C.8 of Annex C) based on the covariance matrices between two variables. A common method of calculating the covariance in a SEM is the maximum likelihood method (MLM). In this study, the AMOS software was used to calculate the

formation of the causal relationship among the concepts that comprise the hypothetical model, and to analyze the level of influence among the causal relationships. As described above, this study confirmed the SEM by verifying its appropriateness from the results of the covariance structural analysis. Various GOF measures were used for this purpose. Generally, the ratio for X^2/df (degree of freedom), the comparative index (CFI), the goodness-of-fit index (GFI), the normal-fit index (NFI), and the root means square error of approximation (RMSEA) have been used to verify the appropriateness of SEM (Cho et al., 2009).

Table C.20 of Annex C shows the covariance structural analysis that was performed based on the hypothetical model. Two methods could have been used to revise the model. The first method involved deleting the path that showed a low causal relationship, and the second method involved an additional causal relationship. In this study, each method was not used. Whereas this study used the modification index, one of the outputs of AMOS, which is the most widely used method of refining the SEM model (Cho et al., 2009).

Based on the modification index offered by AMOS, the hypothetical model was revised a few times and the final model is shown in Figure 5.1

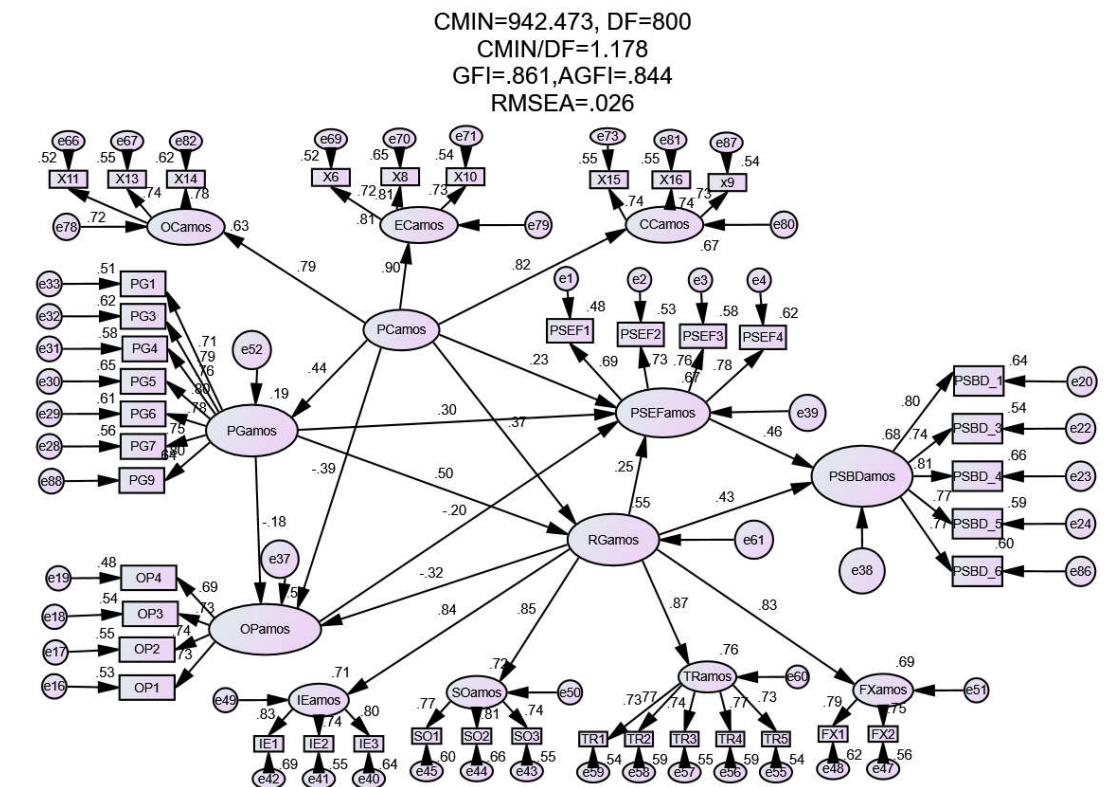


Figure 5.1 the covariance structural analysis on the final model

Therefore, the hypothetical model was revised to come up with a model that has an excellent level of appropriateness in Table C.21 of Annex C. And Table 5.4 shows that the model's level of appropriateness improved with the ratios for X^2/df : 1.179, GFI: 0.861, CFI:

0.975, RMSEA: 0.026, and TLI: 0.973 (Cho et al., 2009).

Table 5.4 Improvement of Goodness of fit measures for SEM Models

GOF measure	Recommended level of GOF	Hypothetical SEM	Final SEM
X2/df	Recommended level from 1 to 2 0	1.221	1.178
GFI	(No fit) to 1(perfect fit)	0.852	0.861
CFI	0 (No fit) to 1(perfect fit)	0.969	0.975
RMSEA	<0.10 indicates most acceptable model	0.029	0.026
TLI	0 (No fit) to 1(perfect fit)	0.967	0.973

5.5.2 Model comparison

From the above analysis of the reliability and validity of the scales of project characteristics, project governance, opportunism, relationship governance and project success, it can be seen the reliability of all the scales are high and they have differential validity. On this basis, test the differential validity of the models (Figure 5.2), compare the goodness of fit level between the models, and evaluate whether the measurement model is reasonable.

In other words, the single factor model (the model that loads all items into a single factor), the two factor model (all items of project governance, relation governance and project characteristics are taken as one variable; and all items of opportunism and project results are taken as another variable), and the three factor model (load all items of project governance and relation governance into one variable, all items of opportunism and project characteristics into one variable, and all items of project efficiency and project business development into one variable), four factor model (load all items of project governance and relationship governance into one variable, load all items of project efficiency and project business development into one variable, and load other items into corresponding variables), five factor model (load all items of project efficiency and project business development into one variable and other items into corresponding variables) and the fitting level of six factor model (load all items into corresponding variables) to judge the discriminant validity of variables in the model.

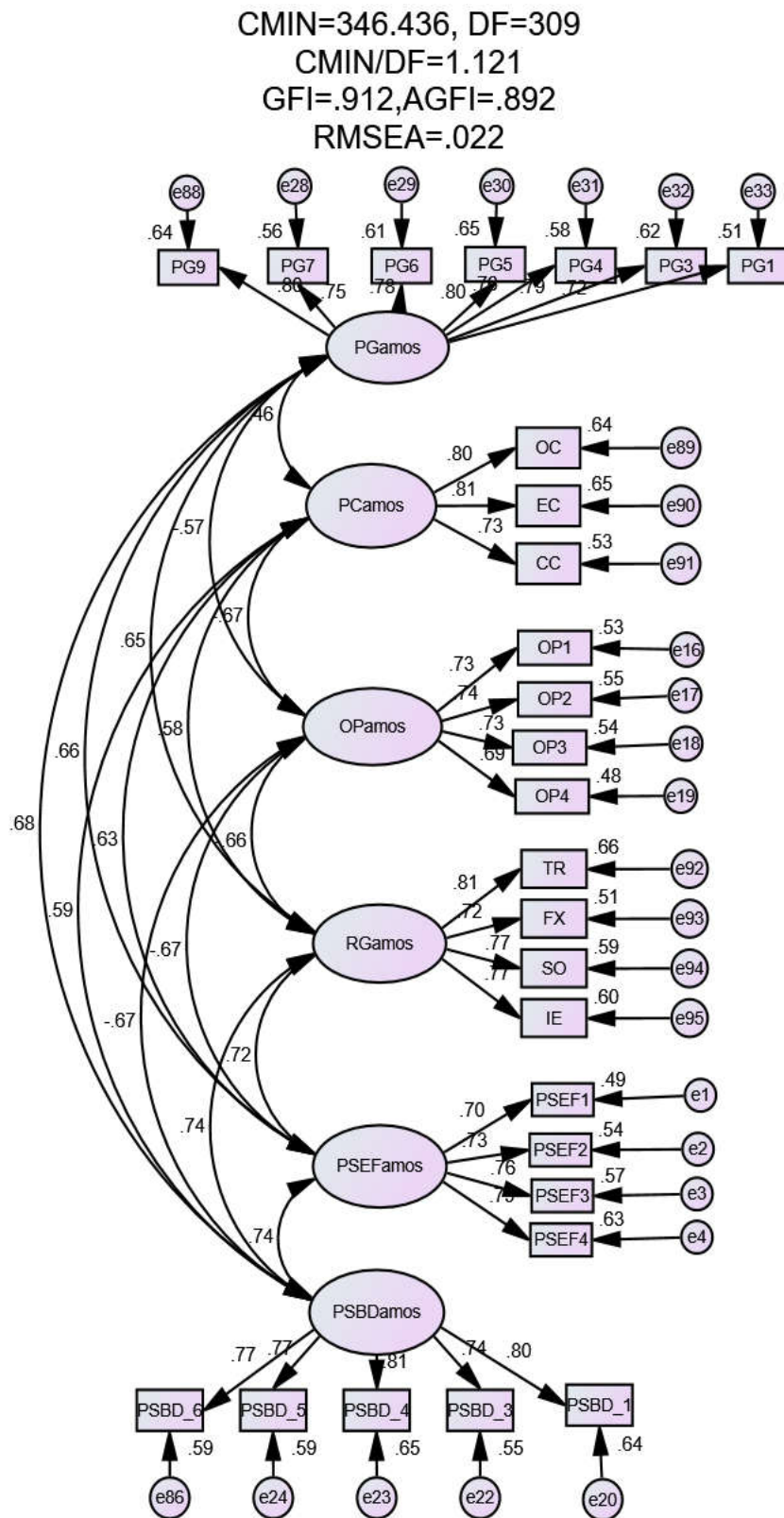


Figure 5.2 CFA of six factors model

The discriminant validity test data in Table 5.5 shows that the GFI, TLI, AGFI, and CFI indices of the Five-factor Model, Four-factor Model, Three-factor Model, Two-factor Model, and Single-factor Model are all lower than the ones of Six-factor Model, whilst their RMSEA

and CMIN/DF values are all greater than the ones of Six-factor Model, which means these models all have insufficient goodness of fit.

Table 5.5 Goodness of Fit Test of Models Comparisons

	CMIN/DF	RMR	GFI	AGFI	IFI	TLI	CFI	RMSEA	AIC
One Factor Model	3.781	.079	.670	.615	.764	.742	.762	.104	1332.931
Two Factor Model	3.337	.071	.702	.651	.802	.783	.801	.095	1187.953
Three Factor Model	2.648	.064	.761	.718	.861	.847	.860	.080	963.889
Four Factor Model	2.321	.062	.784	.743	.890	.878	.889	.072	858.212
Five Factor Model	1.505	.045	.869	.843	.959	.953	.958	.044	600.442
Six Factor Model	1.121	.035	.912	.892	.990	.989	.990	.022	484.436

The Six-factor Model shows that the X^2 / DF is 1.121 and less than 2, the AGFI is 0.912, the RMR is 0.035 and less than 0.05, the GFI is 0.912, the relative fitting indexes: the TLI is 0.989, the CFI is 0.99, the RMR is 0.035, the RMSEA is 0.022 and less than 0.05, which shows that the simulation of the six-factor model is good, and the discrimination validity of all variables in the model is high and meets the requirements of SEM empirical calculation.

5.5.3 Construct validity (AVE)

The convergent validity of every sub-scale is measured by their Standardized Factor Loading (SFL) and Average Variance Extracted (AVE). Table 5.6 shows that the SFLs of every observed variable are between 0.69 and 0.809, most of them higher than the statistically acceptable minimum of 0.7, with only 2 variables showing values below 0.7 (both are 0.69 and higher than 0.5). Besides, the composite reliability indices of the six latent variables are 0.833, 0.815, 0.884, 0.911, 0.822, and 0.853, which are all above the statistically acceptable minimum of 0.7. Their AVEs are 0.556, 0.524, 0.605, 0.594, 0.607, and 0.593, which are all above the statistically acceptable minimum of 0.5.

Table 5.6 Convergent Validity Analysis of Variables

		S.E.	C.R.	P	St Estimate	SMC	1-SMC	CR	AVE
PSEF	PSEF1				0.697	0.486	0.514	0.833	0.556
	PSEF2	0.101	10.539	***	0.734	0.539	0.461		
	PSEF3	0.099	10.838	***	0.757	0.573	0.427		
	PSEF4	0.107	11.242	***	0.791	0.626	0.374		
OP	OP1				0.731	0.534	0.466	0.815	0.524
	OP2	0.09	10.806	***	0.739	0.546	0.454		
	OP3	0.094	10.734	***	0.734	0.539	0.461		
	OP4	0.088	10.134	***	0.69	0.476	0.524		
PSBD	PSBD_1				0.802	0.643	0.357	0.884	0.605
	PSBD_3	0.071	12.703	***	0.739	0.546	0.454		
	PSBD_4	0.075	14.207	***	0.808	0.653	0.347		
	PSBD_5	0.074	13.326	***	0.768	0.59	0.41		
	PSBD_6	0.073	13.394	***	0.771	0.594	0.406		
PG	PG1				0.715	0.511	0.489	0.911	0.594
	PG7	0.094	11.518	***	0.747	0.558	0.442		

PC	PG6	0.1	12.007	***	0.779	0.607	0.393	0.822	0.607
	PG5	0.095	12.408	***	0.805	0.648	0.352		
	PG4	0.097	11.734	***	0.761	0.579	0.421		
	PG3	0.092	12.144	***	0.787	0.619	0.381		
	PG9	0.094	12.325	***	0.799	0.638	0.362		
	OC				0.797	0.635	0.365		
RG	EC	0.081	12.508	***	0.809	0.654	0.346	0.853	0.593
	CC	0.081	11.441	***	0.73	0.533	0.467		
	TR				0.815	0.664	0.336		
	FX	0.055	12.057	***	0.716	0.513	0.487		
	SO	0.079	13.215	***	0.771	0.594	0.406		
	IE	0.079	13.277	***	0.774	0.599	0.401		

Thereafter, discriminant validity and the degree of difference between constructs are analyzed. If the square root of its Average Variance Extracted (AVE) is greater than the absolute value of its correlation coefficient with other constructs, as the results are shown in Table 5.7, the construct is considered to possess good discriminant validity. The square roots of all latent variables' AVE are greater than the absolute values of their correlation coefficients with other variables, which denote good discriminant validity for all latent variables.

Table 5.7 Discriminant Validity Analysis of Variables

	AVE	$\sqrt{AVE}$	RG	PC	PG	PSBD	OP	PSEF
RG	0.593	0.770	0.770					
PC	0.607	0.779	0.582	0.779				
PG	0.594	0.771	0.645	0.459	0.771			
PSBD	0.605	0.778	0.741	0.592	0.679	0.778		
OP	0.524	0.724	-0.66	-0.665	-0.566	-0.668	0.724	
PSEF	0.556	0.746	0.723	0.625	0.658	0.74	-0.674	0.746

5.6 Final SEM Model

As shown in Figure 5.1, the final SEM was deduced from the development of a model with an excellent level of appropriateness through revisions of the hypothetical model... Furthermore, the group of variables (observed, exogenous, and endogenous variables) explains well the casual relationship between various independent variables (PC, PG, OP, RG) and dependent variables (PSEF, PSBD). And it each arrow is a coefficient that shows the level of influence in each causal relationship, which the relationship between various independent variables and dependent variables can be clearly defined (Cho et al., 2009).

Table 5.8 show the statistical amounts of the measurement and structural components, including the measurement errors and confidence levels. The detailed information and analysis regarding Table 5.8 will be presented in Chapter 6 (Cho et al., 2009).

Table 5.8 Estimates of relationship between the various variables

			Unstd. Estimate	S.E.	C.R.	P	Std. Estimate	Label
PG	<---	PC	0.726	0.137	5.277	***	0.439	par_37
RG	<---	PG	0.484	0.074	6.535	***	0.5	par_30
RG	<---	PC	0.588	0.124	4.733	***	0.367	par_38
OP	<---	PG	-0.176	0.078	-2.26	0.024	-0.183	par_31
OP	<---	RG	-0.318	0.098	-3.234	0.001	-0.321	par_45
OP	<---	PC	-0.616	0.141	-4.358	***	-0.388	par_48
PSEF	<---	PG	0.295	0.077	3.853	***	0.297	par_15
PSEF	<---	RG	0.255	0.096	2.663	0.008	0.248	par_16
PSEF	<---	OP	-0.211	0.098	-2.162	0.031	-0.204	par_42
PSEF	<---	PC	0.382	0.14	2.725	0.006	0.233	par_43
PSBD	<---	PSEF	0.525	0.103	5.107	***	0.458	par_10
PSBD	<---	RG	0.506	0.104	4.855	***	0.43	par_17

Chapter 6: Results and Discussion

6.1 Results

6.1.1 Project characteristics and other variables

As shown in Table D.1 of Annex D, the project characteristics with respect to the structural components negatively influenced “opportunism (OP)” (standardized coefficient = -0.388 , $p < 0.001$), positively influenced “project success-efficiency (PSEF)” (standardized coefficient = 0.233 , $p < 0.01$), positively influenced “project governance (PG)” (standardized coefficient = 0.439 , $p < 0.001$), and positively influenced “relation governance (RG)” (standardized coefficient = 0.367 , $p < 0.001$).

Moreover, the project characteristics with respect to the measurement components positively influenced the following observed variables: (i) owner’s capability for project management (X11, standardized coefficient = 0.718 , $p < 0.001$), (ii) owner’s experience with similar projects (X13, standardized coefficient = 0.743), (iii) owner’s level of control over the design changes (X14, standardized coefficient = 0.784 , $p < 0.001$), (iv) project scope definition completion when bids are invited (X6, standardized coefficient = 0.723 , $p < 0.001$), (v) level of design preparation by owner or third party (X8, standardized coefficient = 0.807 , $p < 0.001$), (vi) need under the charting contract with low uncertainty (X10, standardized coefficient = 0.734 , $p < 0.001$), (vii) the project goals and terms could be changed if conditions made it necessary (X9, standardized coefficient = 0.732 , $p < 0.001$), (viii) Contractor’s capability and communication among project team members (X15, standardized coefficient = 0.740 , $p < 0.001$), and (ix) contractor’s paid up capital (X16, standardized coefficient = 0.744 , $p < 0.001$).

We can see that the higher the “owner’s capability for project management” and the “contractor’s paid-up capital” are, and the more active “Contractor’s capability and communication among project team member” is, the higher the “project success-efficiency” and “project success-business development” are. Meanwhile, contractors with a high paid-up capital generally have good management capabilities and skills, as well as good communication among their team members. Therefore, if they would concentrate on a high paid-up capital offshore project, the project performance in terms of cost and schedule growth could become better (Cheng, 2014).

6.1.2 Project governance and other variables

As shown in Table D.2 of Annex D, the project governance with respect to the structural components positively influenced the “relation governance (RG) (standardized coefficient = 0.500, $p < 0.001$),” the “project success-efficiency (PSEF) (standardized coefficient = 0.297, $p < 0.001$),” and negatively influenced the “opportunism (OP) (standardized coefficient = -0.183, $p < 0.05$).”

Moreover, in the measurement component, the project governance positively influenced the “The management board had overall responsibility for project governance (PG1, standardized coefficient = 0.714, $p < 0.001$),” the “Roles and responsibilities for project governance were defined clearly (PG3, standardized coefficient = 0.787, $p < 0.001$), “The project's business case was supported by relevant and realistic information that provided a reliable basis for making authorization decisions (PG4, standardized coefficient = 0.759, $p < 0.001$)” , “There were clearly defined criteria for reporting project status and for the escalation of risks and issues to the relevant organizational levels (PG5, standardized coefficient = 0.805, $p < 0.001$)” , “Decisions made at authorization points were recorded and communicated to the relevant stakeholders (PG6, standardized coefficient = 0.779, $p < 0.001$)” , “The project had a project owner who was the single point of accountability in and to the organization for realizing project outcomes and benefits (PG7, standardized coefficient = 0.759, $p < 0.001$),” and the “The organization fostered a culture of frank internal disclosure of project management information (PG9, standardized coefficient = 0.799, $p < 0.001$).”

Therefore, to improve the project governance and relation governance, as well as lower down the opportunism, the roles and responsibilities for PG need be defined. The board should take the overall responsibilities; the project business cases should be in place with the supporting documents; the project reporting criteria should be defined in different organization levels; decisions need be made in time and communicated with relevant stakeholders and the project organization should have a culture of frank internal disclosure (X. L. Li, 2021; Liang, 2008; X. C. Lu, 2008).

6.1.3 Relation governance and other variables

As shown in Table D.3 of Annex D, in the structural component, the relation governance positively influenced the “project success-efficiency (PSEF) (standardized coefficient = 0.248, $p < 0.01$)”, the “project success-business development (PSBD) (standardized coefficient = 0.430, $p < 0.001$),” and negatively influenced the “opportunism (OP) (standardized coefficient

= -0.321, $p < 0.01$)". Moreover, the relation governance with respect to the measurement components positively influenced the following observed variables: (i) we believe the other party can keep their word throughout the life of the project (TR1, standardized coefficient = 0.733), (ii) we feel confident that the other parties have high levels of integrity and honest (TR2, standardized coefficient = 0.768, $p < 0.001$), (iii) we believe the project engineers and other technical people are competent at what they are doing (TR3, standardized coefficient = 0.740, $p < 0.001$), (iv) we trust that the project participants are able to fulfill contractual agreements (TR4, standardized coefficient = 0.765, $p < 0.001$), (v) We are certain that the other parties have the ability to perform their tasks (TR5, standardized coefficient = 0.733, $p < 0.001$), (vi) Exchange of information among the parties takes place frequently (IE1, standardized coefficient = 0.831, $p < 0.001$), (vii) we keep each other informed about events or changes that may affect the other parties (IE2, standardized coefficient = 0.742, $p < 0.001$), (viii) The parties established a good contact with each other, avoiding possible misunderstandings (IE3, standardized coefficient = 0.802), (ix) The parties are consistent with the expectations of this project (SO1, standardized coefficient = 0.774, $p < 0.001$), (x) The project's overall plan and the implementation scheme are shared by every party (SO2, standardized coefficient = 0.814, $p < 0.001$), (xi) Parties involved in this project regard each other as major partners (SO3, standardized coefficient = 0.743), (xii) We believed that the parties were willing to cooperate to work out solutions if some unexpected situations arose (FX1, standardized coefficient = 0.786, $p < 0.001$), and (xiii) The parties expected to be able to make adjustments in the ongoing relationship to cope with changing circumstances (FX2, standardized coefficient = 0.748).

It can be shown that when the relation governance affecting the project success-business development, opportunism, project success-efficiency, the above results can be interpreted as: The higher the trust, the more information exchange, the higher solidarity, and the higher flexibility between the parties are, the lower opportunism, the higher project success-efficiency and project success-business development. In such case, as an offshore project generally has a higher uncertainty of the time schedule, and normally a relatively lower construction speed compared to other projects, the relation governance should be pay more attention to lower down the opportunism of the parties based on the characteristic such as non-repetitiveness and complexity of the project (X. L. Li, 2021; Yang, 2018).

6.1.4 Opportunism and other variables

As shown in Table D.4 of Annex D, in the structural component, the opportunism negatively influenced the "project success-efficiency (PSEF) (standardized coefficient = -0.204, $p < 0.05$)."

In the measurement component, the opportunism influenced the “partnering firm exaggerates needs to get what it desires (OP1, standardized coefficient = 0.731), the “partnering firm breaches formal or informal agreements to its benefit (OP2, standardized coefficient = 0.739, $p < 0.001$)” , the “partnering firm slightly alters facts to get what it wants (OP3, standardized coefficient = 0.734, $p < 0.001$),”and the “good faith bargaining is not a hallmark of this firm's negotiation style (OP4, standardized coefficient = 0.690, $p < 0.001$).”

The above results show that the higher the partnering firm exaggerates needs to get what it desires, the more the partnering firm breaches formal or informal agreements to its benefit, the more the partnering firm not engaging a good faith bargaining and negotiation are, the lower project success-efficiency is (Y. G. Sun, 2021).

6.1.5 Project success-efficiency and other variables

As shown in Table D.5 of Annex D, in the structural component, the PSEF positively influenced PSBD (standardized coefficient = 0.458, $p < 0.001$).” In the measurement component, the PSEF influenced the “The project was completed on time or earlier (PSEF1, standardized coefficient = 0.692), the “The project was completed within or below budget (PSEF2, standardized coefficient = 0.726, $p < 0.001$)”, the “The project had only minor changes (PSEF3, standardized coefficient = 0.759, $p < 0.001$),”and the “Other efficiency measures were achieved (PSEF4, standardized coefficient = 0.784, $p < 0.001$).”

The above discussion shows that the project was completed on time or earlier, within or below budget, being with only minor changes and other efficiency measures achieved will contribute positively to the project business development and success (X. K. Sun, 2021).

6.1.6 Other relationships between the variables

In the process of developing the final SEM, several significant relationships were identified. As shown in Table D.6 and D.7 of Annex D, the indirect (mediated) effect of PC on RG, OP, PSEF and PSBD are significantly different from zero, which the significant levels are at the 0.001 level ($p=0.000$ or 0.001 two-tailed). The indirect (mediated) effect of PG on OP, PSEF and PSBD are significantly different from zero, which the significant levels are at the 0.01 or 0.001 level (two-tailed). The indirect (mediated) effect of RG on PSBD is significantly different from zero at the 0.01 level ($p=.006$ two-tailed).

A bootstrap approximation obtained by constructing two-sided bias- corrected confidence intervals. This are in addition to any direct (unmediated) effect as discussed previously that may

have among the variables. The indirect (mediated) effect of PC on RG is significantly different from zero at the 0.001 level ($p=.000$ two-tailed). The indirect (mediated) effect of PC on OP is significantly different from zero at the 0.001 level ($p=.001$ two-tailed). The indirect (mediated) effect of PC on PSEF is significantly different from zero at the 0.001 level ($p=.000$ two-tailed). The indirect (mediated) effect of PC on PSBD is significantly different from zero at the 0.001 level ($p=.001$ two-tailed). The indirect (mediated) effect of PG on OP is significantly different from zero at the 0.01 level ($p=.003$ two-tailed). The indirect (mediated) effect of PG on PSEF is significantly different from zero at the 0.01 level ($p=.002$ two-tailed). The indirect (mediated) effect of PG on PSBD is significantly different from zero at the 0.001 level ($p=.001$ two-tailed). The indirect (mediated) effect of RG on PSBD is significantly different from zero at the 0.01 level ($p=.006$ two-tailed). The indirect (mediated) effect of RG on PSEF is not significantly different from zero at the 0.05 level ($p=.058$ two-tailed). The indirect (mediated) effect of OP on PSBD is not significantly different from zero at the 0.05 level ($p=.083$ two-tailed).

6.2 Discussion

The aim of our research is to explore the relationships among six constructs: project characteristics (PC), project governance (PG), relation governance (RG), opportunism (OP) and project success (project efficiency-PSEF-, project success-business development- PSBD). These five hypotheses (further divided into 15 sub-hypotheses) were tested (as summary in Table 6.1) to explain whether a project's characteristics, project governance, as well as the opportunism and relation governance among the project partners contribute to the project success in general, and how important the role of an alignment (mediation) among these variables was also in the pursuit of project success. Among them, 14 sub-hypotheses are supported, and one is rejected.

Table 6.1 Results of hypotheses tests.

No.	Hypothesis	H. Type	Result
H1	H1a. Project characteristics have a positive influence on project governance.	Exploratory	Supported
	H1b. Project characteristics have a positive influence on relational governance.	Exploratory	Supported
	H1c Project characteristics have a positive influence on project success-efficiency.	Confirmatory	supported
	H1d Project characteristics have a negative influence on opportunism.	Exploratory	Supported
	H1e The relationship between project characteristics and PSBD is mediated by PSEF.	Confirmatory	supported

H2	H2a. Project governance is positively associated with project success-efficiency.	Confirmatory	Supported
	H2b. Project governance has a positive influence on relational governance.	Exploratory	Supported
	H2c Project governance has a negative influence on opportunism.	Exploratory	Supported
	H2d The relationship between project governance and PSEF is mediated by relation governance.	Exploratory	Supported
H3	H3a. Relational governance positively affects project success-efficiency.	Confirmatory	Supported
	H3b. Relational governance negatively affects project opportunism.	Confirmatory	Supported
	H3c. Relational governance positively affects project success-business development.	Confirmatory	Supported
H4	H 4a: Opportunism is negatively associated with project success efficiency.	Confirmatory	Supported
	H4b: The relationship between opportunism and PSBD is mediated by PSEF.	Exploratory	Not Supported
H5	H5a: Project success-efficiency (PSEF) has a positive influence on project success-business development (PSBD).	Confirmatory	Supported

6.2.1 Impacts of project characteristics

The results present the relationships between project characteristics, project governance, relation governance, opportunism, and the relationship of these variables with project success. The goal of investigating is to use the understanding that stemmed from empirical analysis to understand how the different project characteristics could lead to more successful projects. Indeed, the relationships uncovered by this investigation support some of the existing understanding of the factors that influence project success in the previous literatures, also uncover some new findings.

The first point to note is that this investigation has identified a statistically significant positive relationship between independent variables (project characteristics) and dependent ones (project success). In more detail, project characteristics (PC) have a positive influence on project success-efficiency (PSEF) (H1c). And the relationship between PC and project success-business development (PSBD) is mediated by PSEF (H1e). The indirect (mediated) effect of PC on PSBD is significantly different from zero at the 0.001 level ($p=.001$ two-tailed). The indirect (mediated) effect of PC on PSBD is 1.028. That is, due to the indirect (mediated) effect of PC on PSBD, when PC goes up by 1, PSBD goes up by 1.028.

These findings are in line with previous arguments and the findings in the literatures. Hussein (2019) have identified a set of context dependent success factors that must be adhered to increase the likelihood of success for each project characteristic. Technological characteristics are also correlated with the project performance (Locatelli et al., 2017).

Olanrewaju et al. (2022) revealed by research that the five main prequalification criteria affecting the project success for selection of contractors are expected completion date, health and safety records, financial capacity/stability of subcontractors, tender price & quotations submitted, and previous performance of subcontractors. Empirical testing of Barney's VRIO framework shows there is an significant relationship between the project management asset characteristics valuable (V), inimitable (I), rare (R), organizationally supported (O) as independent variables, and firm-level performance (F), project-level performance (P) , as dependent variables (Mathur et al., 2014). Cho et al. (2009) analyzed the overall relationship between project performance and a project's characteristics and identified the level of influence of the latter on the former. The study by Ling et al. (2004) concluded that contractors' adequacy of plant and equipment, as well as design ability would ensure speedy completion of the projects. A contractor's track record, which have completed past projects to acceptable quality, is also an important variable. And they must have ability in financial, health and safety management (Park & Kwak, 2017). Intangible project management assets are found to be a source of competitive advantage (Mathur et al., 2007). Radhakrishnan et al. (2021) pointed out client collaboration and team diversity have significant positive relationships with project agility. And project team members' adaptive performance partially mediates the relationship between project agility and success (Radhakrishnan et al., 2021). Project management assets directly impacting project-level performance and impacting firm-level performance, and project-level performance has a direct effect on firm-level performance. The project-level performance also mediates the relationship between firm-level performance and the asset characteristics have important implications (Jugdev et al., 2020). Project management maturity is significantly related to all vertices of the iron triangle (time, cost and technical performance) dimensions of success (Berssaneti & Carvalho, 2015). Prior to the pricing stage, the projects selected competitively on non-price criteria exhibited significantly better performance than those competed on the price to win the work (Manley & Chen, 2016). Manufacturer's specific investments have a positive direct effect, but a negative indirect effect through customer integration, on customer's opportunism (K. Wang et al., 2021).

Hypotheses 1e were accepted as the project efficiency (PSEF) mediates the relationships between project characteristics (PC) and project success-business development (PSBD). The results imply that the influences of project characteristics factors are enhanced on PSBD through project efficiency. So, project efficiency leads to project effectiveness. The firms working on offshore projects should focus on time, cost, and quality of such projects to gain the ultimate long-term success. As these projects mainly fail due to their poor delivery schedule

management which is not as being promised or due to the failure of project management which mainly go beyond the boundary of cost, time, and scope. Thus, we may say that for getting long results in offshore projects, the short-term results are relevant important as well (Maqbool, 2018).

And this investigation has discovered correlations between project characteristics and other variables that had not been previously widely identified in the literature. Project characteristics have a positive influence on project governance (H1a), positive influence on relational governance (H1b), and a negative influence on opportunism (H1d). Such as, the regression weight for PC in the prediction of PG is significantly different from zero at the 0.001 level (two-tailed). When PC goes up by 1 standard deviation; PG goes up by 0.439 standard deviations.

When the various project characteristics affecting the project governance, opportunism, relation governance, and the methods of measuring these are considered, the above results can be interpreted as: The higher the “owner’s capability for project management”, the more “owner’s experience with similar projects”, and the higher “owner’s level of control over the design changes” (the observed variables that comprised the owner’s characteristics) are, the lower opportunism, the higher project governance, and the higher relation governance are. Furthermore, the higher the “project scope definition completion when bids are invited”, the more “level of design preparation by owner or third party”, and the higher “owner’s level of control over the design changes” (the observed variables that comprised the environment characteristics) are, the lower opportunism, the higher project governance, and the higher relation governance are. As well as the higher the “the project goals and terms could be changed if conditions made it necessary”, the more “Contractor’s capability and communication among project team members”, and the higher “contractor’s paid-up capital” (the observed variables that comprised the project characteristics) are, the lower opportunism, the higher project governance, and the higher relation governance are.

Offshore projects are subject to a high level of uncertainty; therefore, these issues need more attention. External uncertainty generally originates for various reasons, such as over-adequate supply of offshore rigs, swing in the price of materials, inadequate demand, declaration of day rate, oil price fluctuation and unfavorable natural environments; which stresses the difficulty of management caused by differences in coalitions created by contracts based on the project characteristics itself (P. Lu et al., 2016).

6.2.2 Impacts of project governance

The results present the relationships between project governance with other three variables

(project success-efficiency, relation governance and opportunism). The first point to note is that this investigation has identified a statistically significant positive relationship between independent variables (project governance) and dependent ones (project success-efficiency). So, it can be concluded that project governance has a positive impact on project success-efficiency (H2a).

This finding appeared to be in line with previous arguments in the literature that project governance is positively associated with project success-efficiency. International empirical evidence has been presented to show that effective project governance is instrumental in driving projects to success. Custom project life cycle that is coupled with custom project governance could enhance the chances of success (Teoh et al., 2021). Five project governance mechanisms (Vision, Sponsor, Change, KPI and Monitor) significantly correlate with project success and are effective at different stages in the project lifecycle (Young et al., 2020). Project success is positively influenced by project strategy and alignment between business strategy and project strategy affects project success positively (Soltani, 2020). Sirisomboonsuk et al. 2018 suggest that project governance have a positive impact on project performance, and all the dimensions of project governance (i.e., portfolio direction, project effectiveness & efficiency, project sponsorship and disclosure & reporting) are positively associated with project performance as well (Sirisomboonsuk et al., 2018). Müller et al. (2017) indicates governmentality being positively associated with project level-project success as well as organizational level-project success, and effective project governance improves project success. Additionally, the development and monitoring of a high-quality project business case identified as one of the most effective project governance and benefit management practices for improving project success (Musawir et al., 2017). Joslin and Müller (2016) indicate that project success correlates with increasing stakeholder orientation of the parent organization.

This research suggests that top managers need to be actively involved in the governance of projects for their organizational strategies to be implemented and project benefits will be realized. The theoretical framework is supporting the perspective of the project governance built on corporate governance theories and theories of planned change. This is a significant support finding because project governance guidelines to date have been strongly influenced by not only project management theories but also corporate governance. It appears that project governance is better understood through corporate governance and change management theories (Young et al., 2020).

Secondly, the results explored that the relationship between project governance and PSEF is mediated by relation governance (H2d). The indirect (mediated) effect of PG on PSEF is

significantly different from zero at the 0.01 level ($p=.002$ two-tailed). The indirect (mediated) effect of PG on PSEF is .193. That is, due to the indirect (mediated) effect of PG on PSEF, when PG goes up by 1, PSEF goes up by 0.193.

Even though this hypothesis is exploratory, the finding can be explained by the previous arguments in the literatures. The study by Galvin et al. (2021) reveals culture governance, and trust are interlinked and complementary, and managers need to reflect holistically on their interactions in order to establish collaborative, rather than opportunistic behaviors (Galvin et al., 2021). Rooted in the domain of project governance and its related theoretical concepts, relational governance has been considered as a critical factor to achieve a project efficiency and better project success (Bhatti et al., 2021). Client can be involved in a vendor relationship at multiple hierarchical levels, i.e. lower, middle and senior level of management. Senior management can be involved in maintaining the relationship, taking critical decisions and giving strategic direction to ensure that the relationship outcome is both beneficial and sustainable (Chaudhry et al., 2018). Badewi (2016) suggest that a significant proportion of organizations adopt project management (PM) and Benefits management (BM) concurrently. PM practices were not only found to influence project investment success but also to affect project management success. Nevertheless, the probability of project success is enhanced significantly when PM and BM practices are combined together (Badewi, 2016). Benítez-Ávila et al. (2018) shows by study that relational governance with its elements of relational norms and partners' trust acts as a mediator between contractual governance and partners' contributions leading to project performance. Relational governance elements are suggested to operate as compensators of contractual governance. This raises new research challenges such as, how cross-project governance factors have an impact on governance at the project level, and how the interplay between relational and contractual governance is (re) constituted over the life-cycle of project (Benítez-Ávila et al., 2018).

Relation governance (RG) was found to partially mediate the relationship between project governance (PG) and project efficiency (PSEF), thus indicating that a strong relation governance climate would encourage the development and leadership of a project governance process in projects. PG creates the necessary roles and responsibilities as well as the system of accountabilities that are necessary for effective RG from the perspective of project owner. Also, PG plays a vital role in ensuring that benefits are constantly defined, reviewed, and aligned with strategic objectives of the project owner's organization. Furthermore, the relation governance and the project governance framework together may provide the much-needed senior management support of both project owner and project contractor to champion the benefits-

oriented view of projects firstly an emphasis on the short-termism of on project delivery within time, cost, and scope/quality and further contribute to the long-term project business development. To summarize, an integrated framework of relation governance practices of project supplier supported by strong project governance from the project owner helps to ensure that project investments create the required value and support organizational strategic objectives of the main project stakeholders, project owner and main project supplier (Musawir et al., 2017).

To inquiry how relation governance may mediate the association between project governance and project success. The impact of relational governance on project success is not independent of context. In line with current contextual understanding of project success and the assumptions of contingency theory, the project context in form of its governance plays an important role. Given through the relational governance and norms in combination with the project governance, the level of flexibility provides for variance in project success. Providing for high flexibility in managerial actions, organic governance does not influence variance in relational governance and norms. In cases of low relational norms, low managerial flexibility has a strong negative effect on project success. Contrarily, in cases of high relational norms, the effect on project success is very positive. In the context of low relational norms, bureaucratic (inflexible) governance insisting on the decision making by formal managers, uniform managerial styles, tried and true management principles, and use of established communication channels is detrimental to project success. By hiding behind bureaucratic rules and processes, these projects become a bureaucratic exercise where one party tries to win over the other party. High relational norms characterized by integrated and informal collaboration, a low managerial flexibility normally leads to predictability of the business partner, which provides for long-term relationships and builds trust. Knowing the processes for the communication channels, decision making, and the management styles eases collaboration in the context of integrated and informal relationships (Müller & Martinsuo, 2015).

And this investigation has also discovered correlations between project characteristics and other variables that had not been previously widely identified in the literature. Project governance has a positive influence on relational governance (H2b), and project governance has a negative influence on opportunism (H2c). Even though Haq et al. (2019) claimed that project governance reduces the opportunism, where the project governance here is further explained as contractual governance and relational governance. In other words, it is argued that contractual and relational governances significantly influence project performance and are useful in reducing opportunism (Haq et al., 2019). The project governance mentioned by Haq

et al. (2019), which means the governance for projects from the perspective of project owners, is quite different with the project governance of our study.

The results of our study have revealed specific project governance mechanisms that are correlated with success. The management board had the roles and responsibilities for the defining project governance clearly and overall responsibility for project governance to drive understanding to the point of agreement with the vision and gaining acceptance of the project. In the initial stage project success seems to require more sense making in the project's business case development, which should be supported from the project governance by relevant and realistic information that provided a reliable basis for making authorization decisions by the project sponsor, as well as the support from the high-level management of all the project stakeholders (Ahmadabadi & Heravi, 2019; Y. Li et al., 2019; Mahjoub et al., 2018).

In order to lower down the opportunism, the project stakeholders should improve the project governance and relation governance. Especially, the roles and responsibilities for PG need be defined; The board should take the overall responsibilities; the project business cases should be in place with the supporting documents; the project reporting criteria should be defined in different organization levels; decisions need be made in time and communicated with relevant stakeholders; a project owner is assigned as the single point of accountability in and to the organization for realizing project outcomes and benefits; and the project organization should have a culture of frank internal disclosure. The escalation of risks and issues should be reported to the relevant organizational levels. The defined criteria are in place for reporting of project status within the organization. Our research is providing quite a clear picture that “decisions made at authorization points were recorded and communicated to the relevant stakeholders”, which includes the project contractors actually (Young et al., 2020).

6.2.3 Impacts of relation governance

6.2.3.1 Impacts of relation governance on project success

Firstly, the results support the proposed notion of relational governance positively affects project success-efficiency (H3a) and relational governance positively affects project success-business development (H3c). The findings show a strong relational governance effect on project success both from efficiency perspective and business development perspective.

The results confirm the findings provided by previous studies. Nevstad et al. (2021) presented that to meet all three criteria (cost, time, and quality) in the project performance measure, mutual project objectives and commitment are important. In the context of a PPP

project, higher inter-organizational trust will have major repercussions on the attitude and conduct of individual private companies involved in a project's development (Irún et al., 2020). The results of the study by Haq et al. (2019) indicate that relational and contractual governances significantly influence project performance. The study by Benítez-Ávila et al. (2018) concluded that relational and contractual governance elements operate sequentially with relational elements (relational norms and trust), playing a mediating role between contractual elements, project actors' behavior and final performance (Benítez-Ávila et al., 2018). In the buildup and maturity phases, relational control remains positively associated with collaborative performance, in the decline phase, both relational control and contractual control have an insignificant impact on collaborative performance (Huang & Chiu, 2018). Müller and Martinsuo (2015) found that in the buyer-supplier relationship relational norms are positively associated with project success. Bstieler and Hemmert (2015) revealed that between partners the strength of prior business ties enhances relational governance, and contractual governance does affect collaboration outcomes, but the impact is weaker than relational governance. The contractual and relational governances, which function as complements rather than substitutes, are important to improve project performance (P. Lu et al., 2015).

In this study, the relational governance has been conceptualized as a sum of trust and relational norms (flexibility, information exchange, and solidarity). The results show a strong and positive influence of relational governance on both project success-efficiency and project success-business development. Therefore, in enhancing the success of offshore projects, it is argued that relational norms and trust play a vital role. It is established that parties develop trust in each other in a contract based on long-term personal relationships. The findings help to infer that parties observe, develop, and test the relationship, and finally confirm the relationship on the basis of relational norms and trust involving flexibility, information exchange, and solidarity (Haq et al., 2019).

6.2.3.2 Impacts of relation governance on opportunism

The findings of this study support the hypothesis of relational governance negatively affects project opportunism (H3b) and confirm the findings of prior literature such as that authored by Haq et al. (2019), P. Lu et al. (2015) and Tangpong et al. (2010), who are of the view that relational governance has a strong and significant negative effect on incidences of opportunism.

The research by Haq et al. (2019) indicate that relational and contractual governances not only significantly influence project performance, but also are useful in reducing opportunism. The research by P. Lu et al. (2015) show that the relational governances and contractual

governances are important to improve project performance, and they function as complements rather than substitutes. Relational governance is more powerful in restricting opportunism (P. Lu et al., 2015). The study by Tangpong et al. (2010) indicated that relational norms and agent cooperativeness interact with each other in mitigating opportunism (Tangpong et al., 2010). The study by Dong et al. (2017) claimed that in a channel relationship, the relational governance affects channel partners' opportunistic behavior. Huo et al. (2016) find that solidarity and detailed contracts are effective safeguards in reducing the providers' opportunistic behavior, while the contract application process leads to opportunism. The results of research by Zhou et al. (2015) show that relational norms have a negative effect on opportunism. Handley and Angst (2015) examined the effects of contractual and relational governance on provider opportunism, the results reveal that in individualistic and low uncertainty avoidance cultures contractual governance is more effective, whereas in collectivist and high uncertainty avoidance societies relational governance is more effective (Handley & Angst, 2015). Trada and Goyal (2020) find that communications (instrumental and social) directly reduces channel members' opportunism, curtail the ill effects of opportunism on relationship performance, and weakens (negatively moderate) the positive effects of exchange hazards (antecedents) on opportunism (Trada & Goyal, 2020). Tse et al. (2019) indicate that relationship commitment leads to reduced opportunism, and these effects are subject to two types of uncertainty--environmental uncertainty and behavioral uncertainty. Paswan et al. (2017) indicates that the interaction between participation and solidarity reduces opportunism, whereas participation's interaction with role integrity and mutuality seems to enhance opportunism.

From the above-mentioned research results, it can be argued that relation governance reduces opportunism. Thus, to adjust a party's behavior, participants of the contract may rely on relational governance. By sharing values and norms, a party's opportunistic behavior can be curtailed and limited (Handley & Angst, 2015). The validity of trust and relational norms is most prominent in controlling opportunistic behavior. The above discussion indicates that in curbing a party's opportunistic behavior, relational norms and trust are very effective (Haq et al., 2019). When operating in a low relational norm, competitive context, the parties may be reluctant to act according to their own conscience. As a result, in the low relational norm context, the cooperativeness of the parties cannot fully exert its opportunism reducing effect consequently, uncooperative human parties may compromise the opportunism-reducing effect of relational norms, and the recurring opportunism may eventually drive the relationship to the point of dissolution. So, regarding opportunism reduction, the best-case scenario is when cooperative parties operate in a high relational norm context (Tangpong et al., 2010).

6.2.4 Impacts of opportunism

In H4a, we have hypothesized that opportunism has negative effects on project success efficiency. The results of the structural model support the proposed hypothesis and are in line with most of the previous research.

Pathak et al. (2020) using the transaction cost theory lens, report that actors' opportunistic behavior led to value co-destruction (such as termination of relationship). The study by Um and Kim (2018) suggested that opportunism acts as a barrier against project performance. Inter-firm opportunism affects organizational performance through a mediating process including commitment, overall satisfaction, functional conflict, and trust (X. Wang & Yang, 2013).

And our research results denied the findings of few previous studies regarding the relationship between opportunism and project performance. Haq et al. (2019) has hypothesized that opportunism has negative effects on project performance. Surprisingly, the results do not support the proposed hypothesis. And P. Lu et al. (2015) claimed that the opportunism does not have a direct negative impact on project performance.

We predict and verified that opportunism of project stakeholders will dampen the project success-efficiency, based on the TCE theory. First, if a party of project is engaging in opportunistic behaviors, such as withholding or distortion of useful information, another party is likely to take the view that this damages their credibility and reliability in the partnership moving forwards. In such case, another party would retaliate by reducing the exchange of valuable information and its work commitments with the unreliable partner. So, the exchange becomes more effortful, which has dramatic consequences for the efficiency of the project work. Second, another party may perceive that the counterpart breaches agreements to its own benefit and is not fulfilling contractual obligations, accordingly, another party may to a greater extent, invest and try to set up protective mechanisms and strategies control over the counterpart's behavior. As a consequence, Due to increase the exchange process and management cost would become sub-optimal (Musarra et al., 2021).

And this investigation has also discovered correlations between opportunism and project success-business development that had not been previously widely identified in the literature. The relationship between opportunism and PSBD mediated by PSEF is denied (H4b). The indirect (mediated) effect of OP on PSBD is not significantly different from zero at the 0.05 level ($p=.083$ two-tailed). The indirect (mediated) effect of OP on PSBD is $-.111$. That is, due to the indirect (mediated) effect of OP on PSBD, when OP goes up by 1, PSBD goes down by 0.111.

This can be explained that the higher the partnering firm exaggerates needs to get what it desires, breaches formal or informal agreements to its benefit, slightly alters facts to get what it wants, and, not engaging a good faith bargaining and negotiation are, the lower project success-efficiency is. This does not mean it further lead to the lower project success-business development. Taking the offshore projects as example, when the party with opportunism behavior escaped from the contract by terminating, the project contractor or supplier may find a new client to make the project useful to add value to the business of project contractor or supplier (Galvin et al., 2021; Jia et al., 2021; Tran et al., 2021; Zhang et al., 2021; Zhao et al., 2022).

6.2.5 Impacts of project success-efficiency

We have investigated to what extent project efficiency is correlated with overall project success. We found that project efficiency is correlated with project success. This supports the hypothesis of H5a: Project success-efficiency (PSEF) has a positive influence on project success-business development (PSBD).

As suggested by many authors that project efficiency is an important contributor to project success. Serrador and Rodney Turner (2014) found that project efficiency is 56% with overall project success. ERP investment success is associated with the organization's project and benefits management institutional logics (Badewi & Shehab, 2016). Project management (PM) practices were not only found to influence project management success but also to affect project investment success (Badewi, 2016). Jugdev et al. (2020) validates that project-level performance has a positive and significant impact on firm-level performance. The effective alignment of projects with the organizational strategy (PPM effectiveness) has positive impact on the success of the portfolio (Petro & Gardiner, 2015). The effectiveness (long-run success) in renewable energy projects is mainly depends upon the efficiency (short-run success) of the critical success factors (CSFs) involved in renewable energy projects (Maqbool, 2018).

In offshore projects, efficiency, and effectiveness both are crucial to ensure a guaranteed project success. Effectiveness is long-term success criteria while efficiency is short-term success criteria. Efficiency is considered as an internal process rating, whereas effectiveness is seen as a key-stakeholders' satisfaction rating (Maqbool, 2018).

Chapter 7: Conclusion and Implication

7.1 Conclusion

The starting point of our research was the claim for a more standardized approach to measuring main project characteristics (PC) applicable to offshore project within Chinese context. Yet, for measuring dimensions of PC, no agreed-upon scale yet exists, and hardly any of the scales employed in quantitative studies so far are suitable for offshore projects as well. We contribute to project management research by providing a new developed version of a PC scale based on previous literature and the knowledge from the offshore industry. We conclude that the scale is already of high psychometric quality (different forms of reliability and validity) in its current version.

In today's business, the success of projects has a direct impact on the success of the firm, even though projects are considered as part of business operations. Suggesting and implementing several project management methods and methodologies to improve project success, therefore, have been the main attempt of researchers and practitioners. Yet, the low success rate of projects as evidenced by many surveys and studies, demand for a new way of enhancing project success. A new paradigm of governance to help improve project performance and success was suggested by the researchers, which is employing project governance (Sirisomboonsuk et al., 2018).

Our research tries to investigate the questions of how to enhance project success through project governance framework. By exploring the relationships among project governance, relation governance and project performance, project characteristics and opportunism are also taking into consideration. Our study provides a research project governance framework using six constructs: 1) project characteristics comprised of project owner characteristics, project contractor characteristics, and project environment characteristics, 2) relation governance comprised of information exchange, solidarity, flexibility, and trust, 3) project governance comprised of governance responsibility and roles defined, the board assigned to take overall responsibilities, project business case, defined criteria for reporting of project status, decision made and recorded as well as communicated, single point owner account for outcomes and benefits, and culture of frank internal information disclosure, 4) opportunism comprised of exaggerates needs, breaches formal or informal agreements, alters facts and bad faith bargaining, 5) project success comprised of project success- efficiency and project success-business

development, which project efficiency is based on time or schedule, cost or resources, scope or requirements and quality, whereas project success is based on the business development and value creation from the firm level.

The survey instrument was extracted from the existing literatures or developed purposely to test this set of hypotheses. To quantitatively assess the relationships among these constructs, we surveyed project management professionals, academic professionals, and PhD students, who had at least three years of work experience and taking appropriate project-related positions in the organization. All five hypotheses with 15 sub-hypotheses are tested (Sirisomboonsuk et al., 2018).

The results suggested that both project governance and relation governance have a positive impact on project success-efficiency (PSEF), the relation governance further have direct positive impact on project success-business development (PSBD). Moreover, we found that three dimensions of project characteristics (i.e., project owner characteristics, project contractor characteristics, and project environment characteristics) were positively associated with project governance, relation governance and project success-efficiency, while all four dimensions of relation governance (i.e., information exchange, solidarity, trust, and flexibility) were positively associated with project success- efficiency and project success-business development. Additionally, the project characteristics, project governance and relation governance are all negative with opportunism, and the opportunism further negatively affect project success-efficiency (Carvalho et al., 2015; Gevelt et al., 2020; Maqbool & Ye, 2018; Tam et al., 2020).

In short, this research attempts to identify the effectiveness of project governance and relational governances on project success in offshore projects. Using offshore projects in China as the empirical setting, we have five major findings. First, both project governance and relational governance are important in improving project success and project governance is more effective than relational governance. Second, project governance and relational governance function as complements, rather than substitutes. Third, project characteristics positively impact the project success whereas opportunism does significantly negatively influence project success. Fourth, both project governance and relational governance play important roles in mitigating opportunism. Fifth, different stakeholders in offshore projects are not have the same criteria of project success, the project should evaluate not only from the short term , project level-project efficiency, but also from the long term value creating ,firm level-project business development (P. Lu et al., 2015).

This research concludes that both project governance and relation governance are positively associated with project success-efficiency. More importantly, it is found that the alignment

between project governance and relation governance has a positive impact on project success-efficiency. We also found that both project governance and relation governance have a negative impact on opportunism of project parties. Being as part of the operational strategy in facilitating the success of projects, these results provided evidence to project management professionals in regard to project governance and relation governance (Sirisomboonsuk et al., 2018).

7.1.1 Key components of project characteristic

With respect to the first research question, what are the key components of project characteristic for the success of offshore projects? How do project characteristics affect project success?

This study presents a project characteristic (PC) measurement of offshore projects that was successfully validated empirically. The measurement items identified constitute a valid and reliable instrument for measuring project characteristics, making them appropriate for future empirical research. This validated measurement of the project characteristics includes three sub-dimensions. And for the first time, the relationship between project characteristics and project success of offshore projects are researched. The analysis results show that the strong positive relationship exists between project characteristics and project success (Luo et al., 2017).

The dimensional results of PC suggested that managers should focus on three project characteristics dimensions for offshore projects as well as being applicable to the similar projects, namely, project environment characteristics (project scope definition completion when bids are invited, level of design preparation by owner or third party, need under the charting contract with low uncertainty), project owner's characteristics (owner's capability for project management, owner's experience with similar projects, owner's level of control over the design changes), and project contractor characteristics (the project goals and terms could be changed if conditions made it necessary, contractor's capability and communication among project team members, contractor's paid-up capital). When carrying out projects, these three dimensions were significantly positively directly associated with project success-efficiency and further indirectly impact the project success-business development (Cho et al., 2009).

This study analyzed the overall relationship between a project's characteristics and project success instead of the previous studies on the relationship between a few project characteristics and project success. In other words, this study deduced the overall causal relationship and level of influence among 9 main project characteristics for the success of offshore projects categorized as project owner characteristics, project contractor characteristics, and environment characteristics as mentioned above. The resulted from this study can point out in the planning stage for the successful execution of the project, the level of project success demanded by the

project owner and project contractor are affected by the project characteristics themselves. Thus, in the initial project planning and bidding stage, it is expected to help facilitate the decision-making process of project stakeholders. However, this study introduced the project characteristics that should be considered for the successful execution of an offshore project, not part of a direct plan to make a project successful (Cho et al., 2009).

The results also showed that project characteristics have significant effects on project governance and relation governance as well as project success. The results have many practical implications. We recognize that the interaction between these two concepts is more complex than a simple cause-and-effect relationship. Project characteristics determine the responsibilities, roles, and accountabilities that the project stakeholders will emphasize to enable project governance and relation governance. Yet, only if key governance roles, such as the project owner and project contractor, adopt a project and relation governance mindset and embed this mindset into the project management system, project governance and relation governance itself can be effective in supporting organizational strategy and improving project success (Musawir et al., 2017). This means that project stakeholders, including the project owner and project contractor of offshore projects should pay more attention to the project characteristics at the early stage of the projects, and understood that the project governance and relation governance shall be influenced by the project characteristics (Luo et al., 2017).

The present study is the very first attempt in research to present a causal model for determining PCs in offshore projects. Several detail PCs for project success has been identified via literature review and this study. Further, these PCs for project success are evaluated, coded, refined, and lastly classified into three major PCs categories. Furthermore, among these three majors' categories, environmental/context PCs were found to be predominant critical success factors category which influences the project success in offshore projects. The environmental/context factors which influence the project success are; Project scope definition completion when bids are invited (X6), Level of design preparation by owner or third party (X8) and need under the charting contract(X10). Firms should also consider the internal as well as the external environment, which can play an important role in the success or failure of the offshore project (Maqbool, 2018).

This result highlights that, to improve the project success, when selecting projects by the project contractors, managers should focus on project scope definition completion, level of design preparation, owner's capability for project management, owner's experience with similar projects, and owner's level of control over the design changes. When carrying out projects by the project contractor, the managers should be flexible for the goals and terms if

conditions made it necessary, establish open communication cultures and channels among project team members, negotiate good payment terms to get more paid-up capital (Koops et al., 2016; Lindsjörn et al., 2016; Müller & Jugdev, 2012).

7.1.1 Antecedents and consequences of opportunism

With respect to the second research question, how do the project governance and relation governance restrain the opportunism present in offshore projects? What is the relationship between opportunism and project success? And how does opportunism impact project success.

The results of this study empirically supported the following arguments: (1) opportunism negatively affect the project success, (3) project governance and relation governance restrict the opportunism; (2) literatures reviews confirmed that external uncertainty increases opportunism.

This study shows that project characteristics has the largest influence on inter-firm opportunism, followed by relation governance and project governance. These important antecedents represent significant research directions for inter-firm opportunism. Specific assets are a source of transaction risks and exchange hazards. If the demand of offshore facilities declines and the contractor's paid-up capital of offshore project is low, the project contractor need make investments in the offshore projects during the new building period, these investment as specific assets make the project contractor costly to switch to other partners, creating a small number bargaining situation. The project contractor undertaking specific assets is locked in a situation where the project owner might expropriate self-benefit or control the potential loss by opportunism from specific assets through ex post bargaining or threats of contract termination. The project contractor might suffer from depreciation or loss of the proprietary resources in the market fluctuation situation if the project owner obtains self-serving benefits from such transferred information and expertise (Galvin et al., 2021) .

Hence, by employing a more complex framework of the mechanism for the inter-firm opportunism restriction, this study widens the horizon on inter-firm opportunism research (X. Wang & Yang, 2013).

Previous studies have investigated the influence of relational governance and contract governance on opportunism and project success. But the focus of those studies was primarily only from the perspective of project supplier and do not take the project governance of owner side into consideration. Apart from the contract governance, based on survey data collected from the offshore industry, the results of the current study reveal that relational governance together with project governance play an important role in increasing project success and

restraining opportunism (Haq et al., 2019).

Relation governance encourages information sharing, mutual communication and build trust, which in the relationship hinder any thought of opportunism from customers and is beneficial to establish mutual benefits and values, and project governance contributes to establishing an atmosphere of commitment between the project owner and its project supplier or PBFs, which helps exchange partners to maintain long-term cooperation and enhance trust. The establishment of project governance of project owner and the good relation governance capabilities of the project supplier make the project stakeholders become a community of shared interests, in which partners act in unison, share the risk, and achieve a common vision so that the contradicts or inconsistencies between the two parties are minimized (K. Wang et al., 2021).

Furthermore, the project participants of offshore projects, such as classifications (acting similar as construction supervisors), contractors, and subcontractors may also have potential opportunism. The opportunism behaviors harm project success as well. From the managerial perspective, project governance and relational governance should also be further improved, to decrease opportunism of all the stakeholders in offshore project. Second, as the commitment from the project governance of the project owner, improved relational norm and trust with project contractor can effectively restrain the parties' opportunistic action (P. Lu et al., 2015).

Project success is the goal for all projects. Based on relational exchange theory (RET) and the transaction cost exchange (TCE), our study confirm that opportunism negatively affect project success-efficiency. This mainly because the relationship are influenced by the level of uncertainty, complexity, cooperation duration, and other project external and internal environment factors considered in the specific offshore project context, which such circumstances normally caused the opportunism and lead to project failure if not control them well (P. Lu et al., 2016).

Many literatures confirm that opportunistic behavior is a well-known reason for the failure of collaborative buyer-supplier relationships. Gelderman et al. (2020) indicate that purchasers behave opportunistically as a reaction to four types of triggers, such as (1) unsolved quality problems, (2) internal pressure for price reductions refused by the supplier, (3) provocative inappropriate and behavior of sales representatives caused by demand uncertainty, (4) unexpected, easy money opportunities for the purchase. In many cases client opportunism appears to be an integral part of the company culture or be driven by top management. Due to the uncertainty, clients may feel pressure to achieve short-term results, and they want to downgrade a (less-satisfactory) strategic relationship into a leverage relationship, even further to terminate the exchange or relationship (Gelderman et al., 2020).

In the presence of high demand situation, offshore end users are involved in frequent information sharing and close coordination with offshore contractors to retrieve offshore new building activities. However, the process adds excessive burdens for offshore contractors in detecting and responding to end users' actual requirements affected by the demand uncertainty. Moreover, demand uncertainty makes it difficult for offshore contractors to determine their requirements *ex ante* of offshore end users, resulting in ambiguity in contractual terms, especially for the specification of offshore rigs or facilities. Due to the nature of self-interest pursuit, offshore contractors are encouraged to behave speculation in their exchange with the PBFs for the undergoing new building rigs and offshore facilities. Such kind speculation exchange will lead to opportunism behavior of offshore contractors if the market or the contracts leave them space to do so, especially when the project contractor's paid-up capital is low or there is some delay of delivery laid down by the unreasonable project execution supervision (Huo et al., 2016).

7.1.2 Alignment of project governance and relation governance

With respect to the third research question, what is the nature of the relationship between project governance and relation governance? And how does relation governance mediate the relationship between project governance and project success?

This study attempts to identify the effectiveness of project governance and relational governances to improve project success in offshore projects. The results revealed that: 1), relational governance is important in improving project success; 2) project governance plays an important role in improve project success as well; 3), higher level project governance and relational governance together play an important role in improving project success. This analysis has confirmed the effectiveness of project governance and relational governance on the project success supported TCE theory and shown the theory's relevance in explanation offshore project governance. If the firm seeks to improve project success, project governance and relational governances can be emphatically used to achieve this goal (P. Lu et al., 2015)c.

Firstly, we find that project governance is an important catalyst for improving the success in projects. At the same time, we recognize that the interaction between project governance and project success is more complex than a simple cause-and-effect relationship. Project governance creates the responsibilities, roles, and accountabilities that enable the project execution and realize the project output. Yet, project governance itself can only be more effective in improving project success and supporting organizational strategy if key governance roles and responsibilities for PG of project owner being defined; the board taken the overall

responsibilities; the project business cases in place with the supporting documents; the project reporting criteria being defined in different organization levels; decisions being made in time and communicated with relevant stakeholders; a project owner assigned as the single point of accountability for realizing project outcomes and benefits; and the project organization with a culture of frank internal disclosure. And the project owner embeds this mindset into the project management system. The results of our study have revealed that in the initial stage project success seems to require more sense making in the project's business case development, which should be supported from the project governance by relevant and realistic information that provided a reliable basis for making authorization decisions by the project sponsor, as well as the support from the high-level management of all the project stakeholders (Musawir et al., 2017).

Secondly, the relational governance has been conceptualized as a sum of trust and relational norms (flexibility, information exchange, and solidarity). The results show a strong and positive influence of relational governance on both project success-efficiency and project success-business development. Therefore, in enhancing the success of offshore projects, it is argued that relational norms and trust play a vital role. It is established that parties develop trust in each other in an offshore exchange contract based on long-term personal relationships. The findings help to infer that parties observe, develop, and test the relationship, and finally confirm the relationship on the basis of relational norms and trust involving flexibility, information exchange, and solidarity (Haq et al., 2019).

Thirdly, the main findings of this research are that PG and RG practices are required for ensuring project success. In other words, the organizations that combine PG and RG in a single governance framework for managing projects can achieve a significantly higher level of success than other organizations which implement PG or RG only. However, PG practices have a higher and more significant impact on project success than do RG practices. Regarding the PG, assigning the responsibility for obtaining benefits is the most critical factor to project success, while the business case is also important. Likewise, regarding PG practices, clearly defined criteria for reporting project status and for the escalation of risks and issues, decisions made at authorization points communicated to the relevant stakeholders are critical to obtaining project success (Badewi, 2016).

7.1.3 Evaluating the project success

With respect to the fourth research question, what are the criteria that are needed for the success of offshore projects from the perspective of contractors? To what extent is project efficiency

correlated with overall project success?

We have investigated to what extent project success-efficiency (PSEF) is correlated with overall project success-business development (PSBD). We found that PSEF is 46% correlated with PSBD. This supports the assertion that PSEF is an important contributor to PSBD, and shows quite clearly that other factors contribute significantly to both (Serrador & Turner, 2014)

The findings from our research seek to raise the awareness of project contractors regarding the comprehensive and appropriate judgment criteria on the success of offshore project from the perspective of a project contractor. In addition, the proposed criteria can help offshore contractors and managers to deliver a better project success both from the project level and firm level, as well as gain a strategic competitive advantage of project business (Al-Tmeemy et al., 2011)

It will be incompetent to judge a project's success merely according to the objective criteria (i.e., time, cost, and quality). From that reason, it is imperative for offshore contractors to plan at the beginning of the project, such kind of plan should include the project success evaluation criteria, the development of strategies and technologies that respond to current and future customer needs, the way to make sure the short-term project success contribute to the long-term project success. The findings of our research showed that project success is a multi-dimensional concept, in line with previous findings of different literatures. Conceptually, the offshore project is most successful when it is capable in integrating the two success dimensions. The first one is PSEF, which concerns with achieving management targets in terms of completing within the contracted period and allotted budget as well as conformance to the requirements of project specifications. The second dimension is PSBD, which relates to the project's potential in contributing to contractor's project business success in long term in terms of enhancing contractor's reputation; gaining a competitive advantage; increasing the market share; winning further offshore project orders and reaching specified revenue and profits (Al-Tmeemy et al., 2011).

The project efficiency was important gear to enhance the relationship between project success factors and project success. It is observed that the effectiveness (long-term success) in offshore projects can only be observed through project efficiency (short-term success). (Maqbool, 2018)c. Since the project organizations work to ensure internal success at first to gain external success, project efficiency comes first to project success (Maqbool, 2018).

7.2 Implications and recommendations

7.2.1 Theoretical implications

The main theoretical contribution of this study is the development of a model that project characteristics as one of the processes through which project governance and relation governance improves project success. And that opportunism has negative impact on project success, which both project governance and relation governance can restrain the opportunism and the project characteristics itself determine the content of opportunism as well. The model sets the foundations for a theory that explains how project governance framework enhances project success and enables the realization of firm level project business objectives through project level projects success or project efficiency (Khalid et al., 2013 June; Taherdoost & Keshavarzsaleh, 2016).

Firstly, this study analyzed, for the first time, the relationship between project characteristics and success in offshore projects and investigated how project characteristics affect offshore project success. Based on literature review, expert interviews, and questionnaire surveys, scale of project characteristics is developed. Project characteristics were measured as project owner characteristics (OC), project contractor characteristics (CC), and project environment characteristics (EC). The findings support the hypothesized positively relationship between the project characteristics and project success of offshore projects. Furthermore, project characteristics have significant positive effects on project governance and relation governance. Also, the project characteristics have significant negative effects on opportunism of both project owners and project contractors (Luo et al., 2017).

Secondly, project governance and relation governance interact, showing different interactions at different levels (project level, firm level) and types of success (project or project business). The opportunism influences the form of the relationship between them, where project characteristics strengthens the correlation between them and project success. Complex project governance frameworks provide for stable project success among the different stakeholders over different levels of both project level and firm level (Müller et al., 2017).

To be considered in cross-company projects such as offshore projects, we called attention to the combination project governance of project owner and relation governance between the project owner and main project supplier as a potential new success factor. Contributing to an increasingly active track of research by this original idea, this investigates project governance domain contributing to success. The level of informality, flexibility, information sharing, and

mutual trust in a buyer-supplier relationship positively impacts short-term project success in terms of completing on time or earlier, within or below budget, being with minor changes and other efficiency measures achieved (Müller & Martinsuo, 2015).

Thirdly, because the success of a partnership primarily relies on the collaborative efforts of the project participants, transaction cost economic (TCE) claims that opportunism determines project success and project performance. If a party commits to opportunistic behaviors and pursues its own interests by breaking the contract, ignoring obligations, hiding information, or seeking another partner, the other party will suffer from the potential failure of a project. Under the circumstance, the expected quality of a project cannot be generated and the partnership will no longer last through (Um & Kim, 2018).

Finally, this study finds the traditional triple constraint criteria of project success to be incomplete from project-based firm (PBF) perspective. It should be expanded to include the realization of the project business objectives as well as the value adding by the project. This could be another contribution to the growing body of literature of project management and project governance.

Additionally, addressing the lack of an operationalization of project characteristics in the literature especially from PBF perspective, this study develops and validates a scale for project characteristics construct. The findings indicate that this scale is both a valid and reliable measure of the strength of project governance and project management research domain. It is hoped that this will stimulate further empirical research in future (Musawir et al., 2017).

We integrate the various governance forms into an integral part of the overall project governance framework by linking the ‘islands’ of literature pertaining to the different governance facets and forms with the ‘mainland’ of the project governance literature (Musawir et al., 2020). It is important to mention that a particular project governance framework will not definitely lead to better project success and project business success. The study focuses on correlation, not causation, which means it is likely that the project governance approaches are adapted to the status of projects to improve the project success (Derakhshan et al., 2019; Laine et al., 2020; R. Turner, 2020).

7.2.2 Management implications and recommendations

Our research offers important implications for project management practice, especially for the project governance and project management practice.

This study serves practitioners in assessing their project characteristics and experiment with the dimensions and their scales to find their own “best practice”. Practitioners in management

and governance roles will benefit from growing awareness of the importance of project characteristics as a potential success factor in projects, which the characteristics will determine the efforts and resources emphasized on the project governance and relation governance by the project stakeholders (Müller et al., 2017).

While project characteristics is in place to have the highest effective in curbing opportunism among project governance, relation governance and project success, it is in both firms' best interest to avoid placing more chance of the potential opportunism during the early project stage, especially from the PBF perspective, such as the bidding and contract negotiating phase.

The presence of an effective governance structure combining the project governance and relation governance limits the opportunist's ability to negatively influence the performance. In other words, having the governance mechanisms in place does not allow him to realize those intentions despite his opportunistic intentions (Haq et al., 2019). Firms should be aware of the differential effects of project governance and relation governance. Relation governance tends to be more effective in curbing opportunism and facilitating the project success-efficiency. When the managers exert contract provisions to suppress partners' opportunism, they should have more solidarity, flexibility, information exchange and consider the level of their trust. They can rely on relation governance to constrain their transaction partner's opportunism, if firms have developed close trust based on more solidarity, flexibility, and information exchange with each other. In contrast, when their trust is weak, solidarity, flexibility and information exchange is low, they should employ more project governance engaged most by the project owner than relation governance to constrain partner opportunism, otherwise, it will be riskier. Thus, managers should realize the significance of relation governance and be able to adjust their actions accordingly to improve the effectiveness of project governance as well as relation governance (Y. Wang et al., 2021).

Another main practical implication of this study is that the aim of projects is to realize project business value and embed the accountabilities for values realization in the project governance system. Project governance practitioners should champion that the aim of projects is to realize project business value value-oriented view and enabling the organization to develop and implement a comprehensive project governance framework. Our study suggest the managers and practice that in order for organizations to maximize their returns from project businesses, a shift towards a values mindset to evaluate the project success bother from project level and firm level is necessary (Musawir et al., 2017).

The research results and the practical implications presented to CA Company got feedback from the top management and project professionals that they agree on the findings and results

of this research. CA Company is implementing the project governance framework to improve their project success, by revisiting the project governance system, improving their client audit system and revised the internal regulations. Currently, their project business becomes better and better. The managers of CA Company should understand the different functions of project governance, relation governance as well as project characteristics in constraining opportunism. CA Company is suggested to heed the design of both project governance provisions and relation governance provisions. Project characteristics create conditions under which both transactional parties can collaborate in a productive way, while project governance and relation governance provides measures to improve the project success and restrain the opportunism. Whereas opportunism may cause barriers under which both transactional parties can seek self-benefit, while project governance and relation governance provides measures to settle problem. Both are necessary and neither should be neglected.

7.3 Contributions

Developed the project governance framework for EPC projects, to set the foundations for a theory linking the ‘islands’ of the different governance facets and forms with the ‘mainland’ of the project governance literature.

It solves the dilemma between the project-based firm and the EPC enterprise to develop the project business and ensure the success of the project. It can be used for reference. Seeking theoretical explanations for the success or failure of offshore engineering projects.

Build EPC project success model for theoretical research and industrial practitioners to improve the success rate of offshore engineering projects. The traditional triple constraint criteria of project success to be incomplete from project-based firm (PBF) perspective. It should be expanded to measure the realization of firm level project business achievement.

The project governance framework is applicable to the offshore engineering industry as well as other industries, including equipment manufacturing industry, construction industry and even automobile industry etc.

Scale of project characteristics is developed. The relationship between project characteristics and success in EPC projects is investigated.

7.4 Limitations and future studies

Of course, there will be a certain number of limitations for the future study.

This research is believed to be one of the first studies to connect and quantitatively explore relation governance and project governance's impact on project success from the PBF perspective (Martin & Benson, 2021). Restricting the ability to comment on the complex relationships between the concepts is a limitation of this study stems from the use of a quantitative research design. Future research may apply a qualitative design to explore in greater detail how project governance and relation governance interact and vice versa, as well as how both these concepts impact project success (Musawir et al., 2017).

Also, the study sample may not consist entirely of discrete and unique organizations due to practical constraints pertaining to the data collection and sampling strategy. However, it is unlikely that there would be multiple projects from the same organization even though the sample consists of responses' from different PBFs of China (Musawir et al., 2017). There may still be concerns with the data such as common method bias, although extreme care was taken to address such issues as random placement of questions, in the survey, and statistical tests for validity of the results (Martin & Benson, 2021).

The limitation of this research is also that it necessarily focused on one specific context in China. Since any inter-organizational relationship is socially constructed and culturally dependent at both national and industry levels, more research is needed in other industries and other countries. Recognizing that our results deliberately present a PBFs or contractor's perspective, this does not imply that relationship quality is only measured from one perspective. All relationships have two sides. Any gaps in perceptions identified would be worthy of further exploration in themselves (Martin & Benson, 2021).

We do not claim to have grasped all possible types of opportunistic behaviors and triggers. In the project business relationships, future research could try to shed lighter on cultural differences and sectorial differences regarding triggers for owner's opportunism and types of opportunistic behaviors. as Another important aspect of how opportunism influence the project governance and relation governance need be further investigated in the future. Future research may want to explore the justifications of PBFs professional for their unethical and opportunistic behavior (Gelderman et al., 2020).

Moreover, although we try to get more responses during the survey phase, it can be better if the sample size of our study could be increased (Martin & Benson, 2021).

Finally, this study developed and validated a scale for project characteristics. On project governance and project success domain, future studies may apply this scale with different models and in different contexts to advance empirical research (Musawir et al., 2017).

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Annex A: Supporting Supplement of Chapter 2

Table A.1 Definitions of project governance

No.	Definitions or dimensions	Quoted From
1	Project governance is “the use of systems, structures of authority, and processes to allocate resources and coordinate or control activity in a project”	Pinto (2014)
2	“Governance is about the relationships between the board, management and shareholders to set company objectives and monitor performance.”	Kelly (2010, as cited in Sirisomboonsuk et al., 2018)
3	“Aligning project objectives with organizational strategy, achieving set project objectives and monitoring performance.”	Turner (2001, as cited in Sirisomboonsuk et al., 2018)
4	“Governance refers to the set of policies, regulations, functions, processes, procedures and responsibilities that define the establishment, management and control of projects, programs and portfolios.”	APM (2019)
5	“P3 [project, program and portfolio] assurance is the process of providing confidence to stakeholders those projects, programs and portfolios will achieve their scope, time, cost and quality objectives, and realize their benefits.”	APM (2019)
6	APM's (2011) definition of project governance, we refer to corporate governance as an organizational strategy and project governance as an operational strategy in which a good alignment of each other is expected in order to achieve better organization performance.	APM (2011)
7	project governance was the means to acquire order and then the stakeholders could recognize the common interests among underlying threats and chances	(Turner & Keegan, 1999)
8	the main purpose of project governance should be to control projects and finally achieve the business objectives.	(Liu & Yetton, 2007)
9	defined project governance as “a set of management systems, rules, protocols, relationships and structures that provide the framework within which decisions are made for project development and implementation to achieve the intended business or strategic motivation”	(Bekker & Steyn, 2007)
10	Project governance is a process-oriented system by which projects are strategically directed, interactively managed, and holistically controlled, in an entrepreneurial and ethically reflected way, appropriate to the singular, time-wise limited, interdisciplinary, and complex context of projects.	Renz (2007)
11	Project governance is defined as “an oversight function that is aligned with the organization's governance model and that encompasses the project lifecycle [and provides] a consistent method of controlling the project and ensuring its success by defining and documenting and communicating reliable, repeatable project practices”	(PMI, 2016)

12	Garland (2009, p. 10) defines it simply as “the framework within which project decisions are made”.	Garland (2009, as cited in Musawir et al., 2017)
13	It characterizes project governance simply as a system by which a project is directed, controlled, and held to account.	McGrath and Whitty (2015, as cited in Musawir et al., 2017)

Table A.2 Dimensions of Project Governance

Model and Dimensions		Quoted From
literature on project management can be divided into four categories	Project organization as one specific organizational form. Numerous best practices for project management. Literature on one specific project management topic, such as risk management. Sector specific project management	Renz (2007)
two streams of literature related to project governance	1) The transaction cost economics literature, drawing mainly from the economics literature, organization theory, and contract law, focuses on the selection of the most efficient form of governance. 2) The corporate governance literature, drawing from, for example, agency theory, has focused predominantly on the exchange relationship between the corporate owner(s) and the agent (typically CEO) employed to run the business on behalf of the owner.	Ahola et al. (2014)
Project Governance and governance of projects	Governance of projects is defined as the governance of groups of projects where as project governance is defined as the governance of a single project.	Turner (1999, as cited in Biesenthal and Wilden, 2014)
Project management and project governance	Project management is mainly concerned with operational control and execution of the project work. Project governance is a 'higher-level structure' to define processes and structures to govern multiple projects.	Biesenthal and Wilden (2014)
project governance, GOP, Governmentality	'Project governance' (governance of individual projects), 'governance of projects' (governance of groups of projects, such as portfolio), and 'governmentality' (the way to govern)	Müller et al. (2015, as cited in Joslin and Müller, 2016)
modules constituting the key responsibilities of project governance:	System management; Mission management; Integrity management. Risk management; Audit management	Renz (2007)
governance paradigms framework--two governance dimensions:	A continuum of the extent of shareholder versus stakeholder orientation (following Clarke, 2004). a continuum on the level of behavior versus outcome control (following Ouchi, 1980)	(Müller & Lecoeuvre, 2014)
Five subject areas of GoP literature:	Five subject areas were recognized as overlapping in the corporate governance and GoP literature: decision making, remuneration, legitimacy, financial objectives, and long-term objectives.	(Müller & Lecoeuvre, 2014)
Ten GoP measurement sub-dimensions	1, decision making, 2, remuneration, 3, legitimacy, 4, financial objectives, 5, long-term objectives Above for the shareholder–stakeholder dimensions 6, rule orientation, 7, level of control, 8, adherence to job descriptions, 9, role of support institutions, 10, compliance expectations Rest for the behavior–outcome control dimensions	(Müller & Lecoeuvre, 2014)
project governance four key principles	(1) identify a single point of accountability, (2) ensure a service delivery focus, (3) separate the project and	Garland (2009)

governance models	the organization governance structures, and (4) separate stakeholder management and project decision making Müller (2009) suggests governance models should help fostering projects to be successful, prioritize projects for best use of resources, identify projects in trouble, and rescue, suspension, or termination of these projects as appropriate.	Müller (2009, as cited in Zwikael and Smyrk, 2015)
three main categories of project governance models	Mancini (2011: 650) identified three main categories of project governance models: a single firm's governance scheme where multiple projects related within this firm. multi-firm projects where various different organizations or companies engage in contractual agreements. projects as hybrid or network involving a few stakeholders and actors with one supreme hierarchical authority.	Mancini (2011, as cited in Zwikael and Smyrk, 2015)
Project governance at different organizational levels	At the highest level, corporate governance. the portfolio, program, and project levels (sometimes referred to as P3 governance)	Musawir et al. (2020)
Five central elements of governance of project (GoP)	Five central elements of GoP for successfully governing internal projects for value generation: PPM, PMOs, Project management, PM model, and Project generation.	(Riis et al., 2019)
four domains and functions of project governance	Four domains that uniquely represent governance: governance alignment, governance risk, governance communications, and governance performance. The four governance functions are oversight, control, integration, and decision making.	PMI (2016)
“Governance framework”	Governance framework means the four domains of governance which includes: structure, processes, functions, and activities for 3P (portfolios, programs, and projects).	PMI (2016)
Six governance processes of PMI	According to Project Management Institute, the project governance processes consist of the following activities: - Strategic Alignment, Roles, Responsibilities and Accountability, Decision Making, Risk Management, Communication and Stakeholder Management	PMI (2016)
Governance of project model -- four components	portfolio direction, project sponsorship, project management, and reporting and eleven general principles to adopt.	(Mossalam & Arafa, 2019)
Project governance literature -external or internal	Project governance literature into two distinct streams: One stream that views project governance as a process external to any specific project. And another stream that treats project governance as a process internal to a specific project.	Ahola et al. (2014)
project governance and project governance framework	In the organizational framework, project governance is executed through the project governance framework by providing project managers, the project team members and project stakeholders with the structure, decision making models, processes, and tools for managing a project.	Haq et al. (2019)

The governance mechanisms can be divided into two categories	The governance mechanisms that are mainly reported in the recent literature can be divided into two categories: relation governance and contract governance.	Haq et al. (2019)
Three elements of contract governance	Lu et al. (2015) conceptualized contractual governance through fundamental elements, specifically change elements and contractual elements.	(Lu et al., 2015)

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Annex B: Supporting Supplement of Chapter 4

Table B.1 Project characteristics affecting project performances

Category	Project characteristics
Project characteristics	Gross floor area of the project Payment mode to the contractor Form of contract Type of building Ownership of building Level of design complexity Level of construction complexity Level of technological advancement Level of specialization required of contractors Percent of repetitive elements Presence of special issues Type of specification Extent to which bid documents allow additions to scope Flexibility of scope of works when contractor is hired Project scope definition completion when bids are invited Design completion by owner when bids are invited Design decisions made by owner when bids are invited Design completion when budget is fixed Bidder's knowledge of the budget Importance for project to be completed within budget Importance for project to be delivered Time given to contractors to prepare bid Time given to owners/consultants to evaluate bids Extent to which the contract period is allowed to vary during bid evaluation stage Importance for the project to be completed on time Bidding procedure Number of bidders Prequalification or short-listing Bid evaluation and selection criteria Bidding environment (Ling et al., 2004)
Owner and consultant characteristics	Consultant's level of construction sophistication Owner's level of construction sophistication Consultant's experience with similar projects Owner's experience with similar projects Consultant's staffing level to attend to contractor Owner's staffing level to attend to contractor Number of design-bid-build/design-build projects handled by consultant in the past Number of design-bid-build/design-build projects handled by owner in the past (Ling et al., 2004)
Contractor characteristics	Contractor's experience with similar types of projects Contractor's experience with similar size of projects Contractor's experience with projects in Singapore Subcontractors' experience and capability Communication among project team members Contractor's prior working relationship with the owner

Contractor's prior working relationship with consultants
Contractor's track record for completion on time
Contractor's track record for completion on budget
Contractor's track record for completion to acceptable quality
Contractor's staffing level
Adequacy of contractor's plant and equipment
Magnitude of change orders in contractor's past projects
Magnitude of claims and disputes in contractor's past projects
Contractor's key personnel's management ability
Contractor's ability in financial management
Contractor's quality control and management capability
Contractor's health and safety management capability
Contractor's technical expertise
Contractor's design capability
Contractor's paid-up capital (Ling et al., 2004)

Source: Ling et al. (2004)

Table B.2 Reliability Analysis of the Scale Measuring PC

Variables	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Project Environment Characteristics	X1	-0.104	0.844	0.603
	X3	0.528	0.474	
	X6	0.608	0.423	
	X8	0.551	0.447	
	X10	0.574	0.442	
Project Contractor characteristics	X4	0.024	0.874	0.744
	X5	0.545	0.694	
	x9	0.683	0.658	
	X15	0.641	0.664	
	X16	0.688	0.651	
Project Owner Characteristics	X17	0.65	0.664	0.832
	X11	0.709	0.766	
	X13	0.673	0.783	
	X14	0.629	0.802	
	X18	0.634	0.8	

Table B.3 Principal Components Analysis of PC

Principal Components	Eigenvalues	Proportions of Variance Explained %	Cumulative Proportions of Variance Explained %
1	6.630	51.002	51.002
2	1.127	8.671	59.673
3	1.039	7.991	67.664

Table B.4 PCA Results of PC

Items	Principal Components		
	1	2	3
X17	.814		
x9	.780		
X15	.755		
X16	.698		
X5	.592		
X8		.776	
X10		.760	
X3		.758	
X6		.661	
X13			.773
X11			.761
X14			.726
X18			.708

Table B.5 Main Survey 1st time PCA Results of PC

Items	Principal Components		
	1	2	3
X6	.752		
X3	.730		
X8	.707		
X10	.628		
X18			
X13		.772	
X14		.737	
X11		.717	
X16			.811
X15			.692
x9	.507		.669
X17		.525	.595

Table B.6 Main Survey 2nd time PCA Results of PC

Items	Principal Components		
	1	2	3
X16	.827		
x9	.797		
X15	.610		
X18	.607		
X3	.606		
X13		.799	
X14		.795	
X11		.734	
X6			.799
X10			.775
X8			.714

Table B.7 Main Survey 3rd time PCA Results of PC

Items	Principal Components		
	1	2	3
X16	.845		
x9	.743		
X15	.697		
X17	.537		
X18	.522	.504	
X14		.799	
X13		.793	
X11		.727	
X6			.816
X10			.768
X8			.715

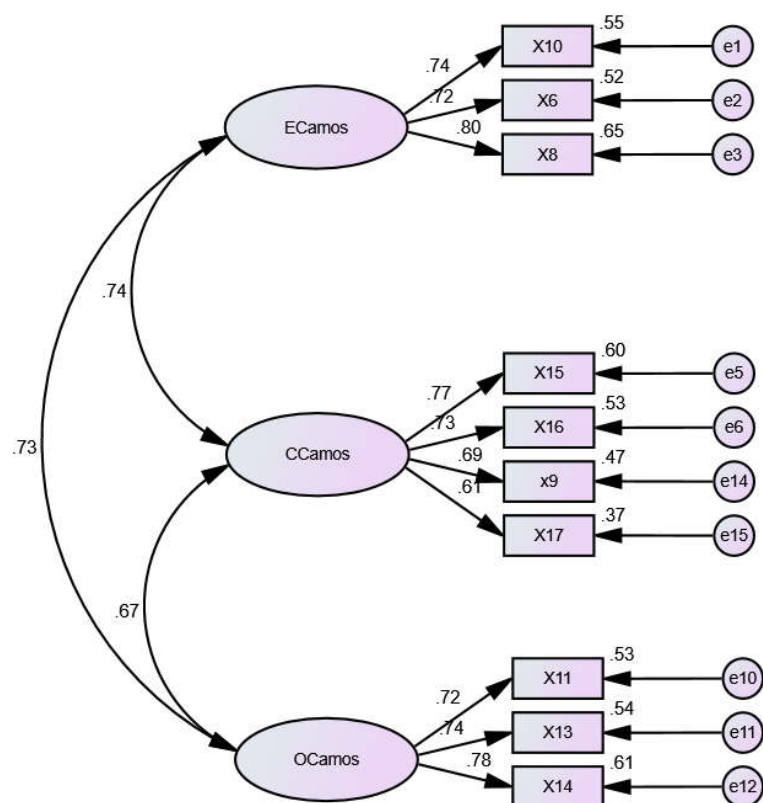


Figure B.1 1st time CFA of PC

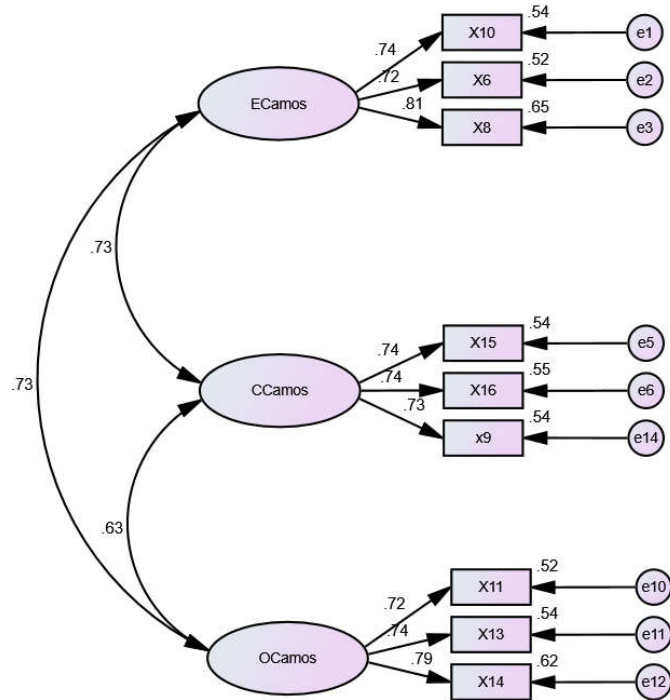


Figure B.2 Final CFA Results of PC

Table B.8 Goodness of Fit of PC

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	21	24.461	24	0.436	1.019
Model	NFI	RFI	IFI	TLI	CFI
Default model	0.974	0.961	0.999	0.999	0.999
Model	RMR	GFI	AGFI	PGFI	RMSEA
Default model	0.021	0.98	0.962	0.523	0.009
Model	AIC	BCC	BIC	CAIC	
Default model	66.461	68.161	141.073	162.073	
Saturated model	90	93.644	249.883	294.883	
Independence model	956.154	956.883	988.131	997.131	

Table B.9 Convergent Validity of the Scale Measuring PC

Latent Variables	Items	C.R.	P	factor loading	SMC	1-SMC	CR	AVE
EC.	X10			0.736	0.542	0.458	0.800	0.571
	X6	10.541	***	0.724	0.524	0.476		
	X8	11.448	***	0.805	0.648	0.352		
CC.	X15			0.738	0.545	0.455	0.783	0.546
	X16	10.286	***	0.744	0.554	0.446		
	x9	10.195	***	0.735	0.54	0.46		
OC.	X11			0.72	0.518	0.482	0.793	0.561
	X13	10.21	***	0.737	0.543	0.457		
	X14	10.658	***	0.788	0.621	0.379		

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Annex C: Supporting Supplement of Chapter 5

Table C.1 Reliability test of scale for project governance

Variable	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Project Governance	PG1	0.711	0.92	0.927
	PG2	0.706	0.92	
	PG3	0.746	0.918	
	PG4	0.706	0.921	
	PG5	0.757	0.917	
	PG6	0.759	0.917	
	PG7	0.727	0.919	
	PG8	0.739	0.918	
	PG9	0.755	0.917	

Table C.2 Reliability Test of scale for opportunism

Variable	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Opportunism	OP1	0.652	0.758	0.814
	OP2	0.644	0.762	
	OP3	0.636	0.766	
	OP4	0.603	0.781	

Table C.3 Reliability Test of Sub-scale for relation governance

Variable	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Trust	TR1	0.658	0.869	0.883
	TR2	0.681	0.866	
	TR3	0.719	0.859	
	TR4	0.71	0.861	
	TR5	0.708	0.861	
	TR6	0.691	0.864	
Information Exchange	IE1	0.731	0.73	0.833
	IE2	0.656	0.804	
	IE3	0.692	0.769	
Solidarity	SO1	0.656	0.767	0.819
	SO2	0.712	0.71	
	SO3	0.652	0.772	
Flexibility	FX1	0.588	.	0.74
	FX2	0.588	.	

Table C.4 Reliability Test of scales for project success (PSEF and PSBD)

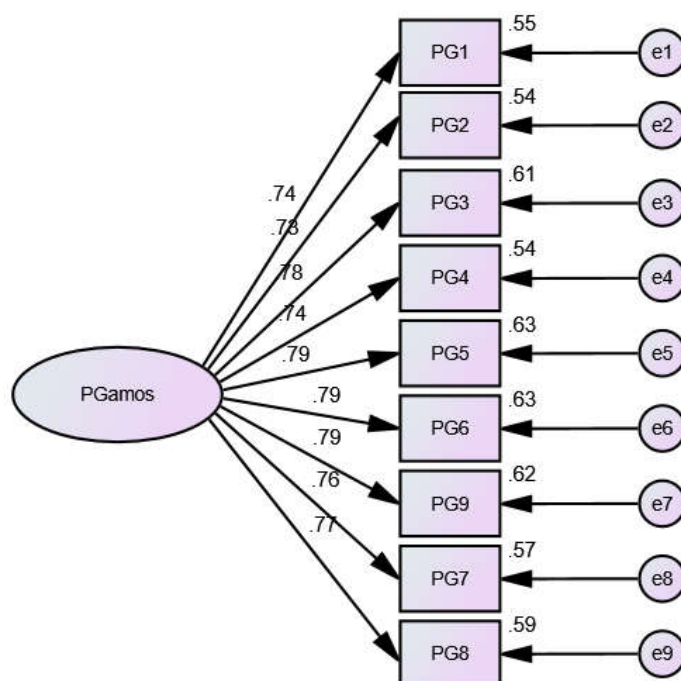
Variable	ITEM	CITC	Cronbach Alpha if item dropped	Cronbach Alpha
Project Success-efficiency	PSEF1	0.637	0.8	0.833
	PSEF2	0.654	0.793	
	PSEF3	0.661	0.79	
	PSEF4	0.697	0.773	
Project Success-business	PSBD_1	0.726	0.888	0.904
	PSBD_2	0.754	0.884	
	PSBD_3	0.704	0.891	
	PSBD_4	0.763	0.883	
	PSBD_5	0.732	0.887	
	PSBD_6	0.736	0.887	

CMIN=34.719, DF=27

CMIN/DF=1.286

GFI=.970,AGFI=.949

RMSEA=.033


Figure C.1 1st time CFA of project governance

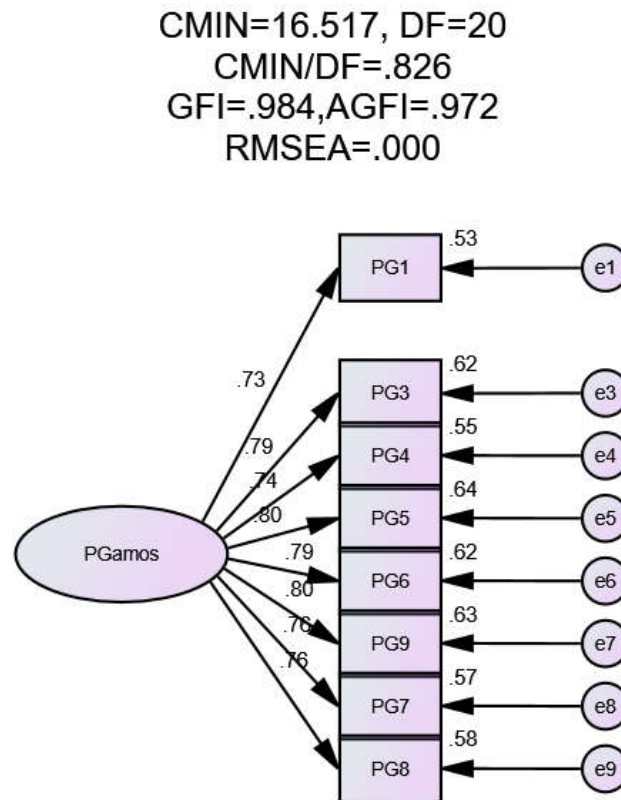


Figure C.2 final CFA results of project governance

Table C.5 Goodness of Fit of project governance

Default model	NPAR	CMIN	DF	P	CMIN/DF
	16	16.517	20	0.684	0.826
	RMR	GFI	AGFI	PGFI	RMSEA
	0.021	0.984	0.972	0.547	0
	NFI	RFI	IFI	TLI	CFI
	0.986	0.981	1.003	1.004	1
Model	AIC	BCC	BIC	CAIC	
Default model	48.517	49.678	105.364	121.364	
Saturated model	72	74.613	199.907	235.907	
Independence model	1232.398	1232.979	1260.822	1268.822	

Table C.6 Convergent Validity of the Scale Measuring project governance

		C.R.	P	St Estimate	SMC	1-SMC	CR	AVE
PG	PG1			0.727	0.529	0.471	0.921	0.593
	PG3	12.39	***	0.786	0.618	0.382		
	PG4	11.624	***	0.739	0.546	0.454		
	PG5	12.64	***	0.802	0.643	0.357		
	PG6	12.413	***	0.788	0.621	0.379		
	PG9	12.532	***	0.795	0.632	0.368		
	PG7	11.909	***	0.757	0.573	0.427		
	PG8	11.967	***	0.76	0.578	0.422		

CMIN=2.022, DF=2
CMIN/DF=1.011
GFI=.996, AGFI=.981
RMSEA=.007

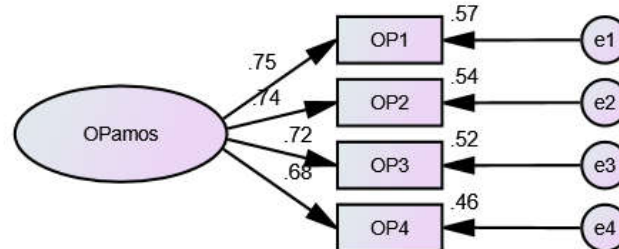


Figure C.3 CFA of opportunism

Table C.7 Goodness of Fit of opportunism

Default model	NPAR	CMIN	DF	P	CMIN/DF
	8	2.022	2	0.364	1.011
	RMR	GFI	AGFI	PGFI	RMSEA
	0.012	0.996	0.981	0.199	0.007
	NFI	RFI	IFI	TLI	CFI
	0.994	0.982	1	1	1
Model	AIC	BCC	BIC	CAIC	
Default model	18.022	18.34	46.446	54.446	
Saturated model	20	20.397	55.53	65.53	
Independence model	340.251	340.41	354.463	358.463	

Table C.8 Convergent Validity of the Scale Measuring opportunism

		C.R.	P	St Estimate	SMC	1-SMC	CR	AVE
OP	OP1			0.752	0.566	0.434	0.815	0.524
	OP2	10.287	***	0.737	0.543	0.457		
	OP3	10.149	***	0.723	0.523	0.477		
	OP4	9.658	***	0.681	0.464	0.536		

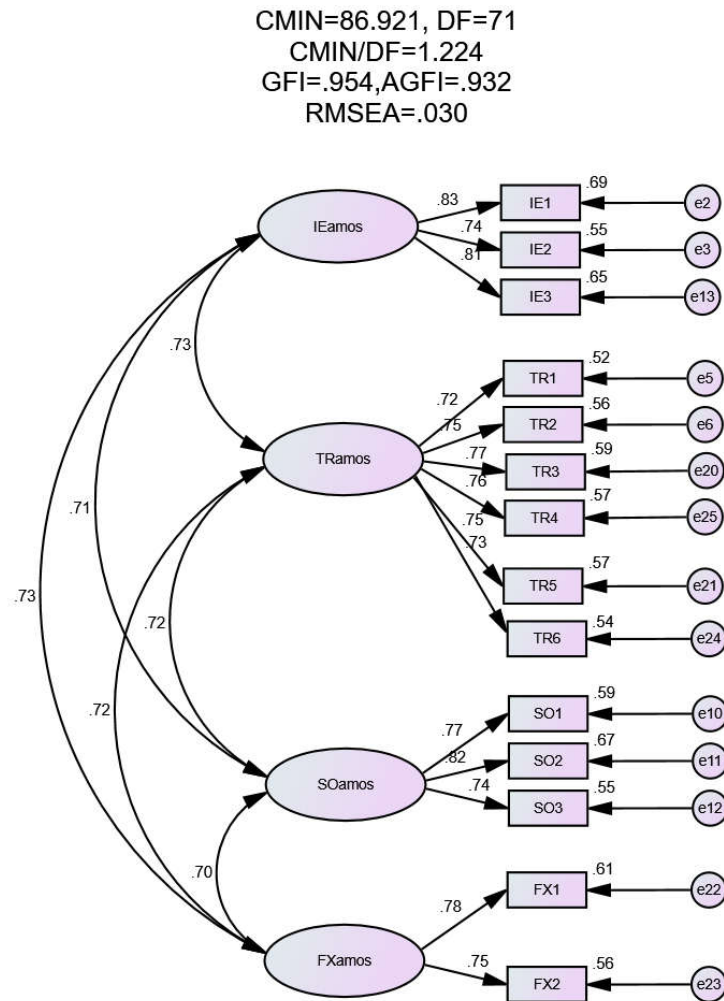


Figure C.4 CFA Results of relation governance

Table C.9 Convergent Validity of the Scale Measuring relation governance

		C.R.	P	St Estimate	SMC	1-SMC	CR	AVE
IE	IE1			0.829	0.687	0.313	0.835	0.628
	IE2	12.445	***	0.739	0.546	0.454		
	IE3	13.715	***	0.806	0.65	0.35		
SO	SO1			0.768	0.59	0.41	0.821	0.604
	SO2	12.538	***	0.821	0.674	0.326		
	SO3	11.456	***	0.741	0.549	0.451		
FX	FX1			0.784			0.884	0.559
	FX2	10.403	***	0.75				
TR	TR1			0.724	0.524	0.476		
	TR2	11.537	***	0.751	0.564	0.436		
	TR3	11.781	***	0.767	0.588	0.412		
	TR4	11.621	***	0.756	0.572	0.428		
	TR5	11.568	***	0.753	0.567	0.433		
	TR6	11.288	***	0.735	0.54	0.46		

Table C.10 Goodness of Fit of relation governance

Default model	NPAR	CMIN	DF	P	CMIN/DF
	34	86.921	71	0.096	1.224
	NFI	RFI	IFI	TLI	CFI
	0.955	0.942	0.991	0.989	0.991
	RMR	GFI	AGFI	PGFI	RMSEA
	0.035	0.954	0.932	0.645	0.03
Model	AIC	BCC	BIC	CAIC	
Default model	154.921	159.136	275.722	309.722	
Saturated model	210	223.017	583.061	688.061	
Independence model	1939.598	1941.334	1989.339	2003.339	

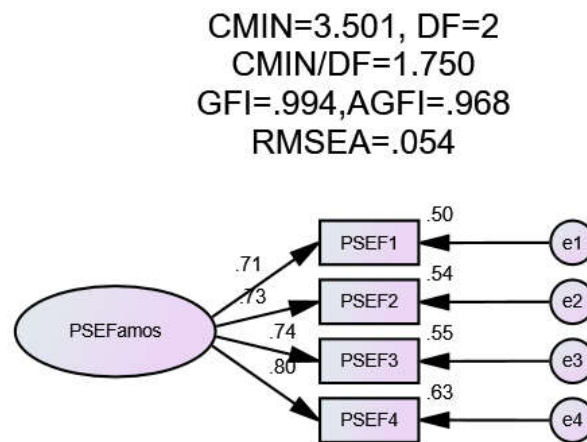


Figure C.5 CFA of PSEF

Table C.11 Convergent Validity of the Scale Measuring PSEF

		C.R.	P	St Estimate	SMC	1-SMC	CR	AVE
PSEF	PSEF1			0.707	0.5	0.5	0.833	0.556
	PSEF2	10.169	***	0.733	0.537	0.463		
	PSEF3	10.29	***	0.744	0.554	0.446		
	PSEF4	10.758	***	0.795	0.632	0.368		

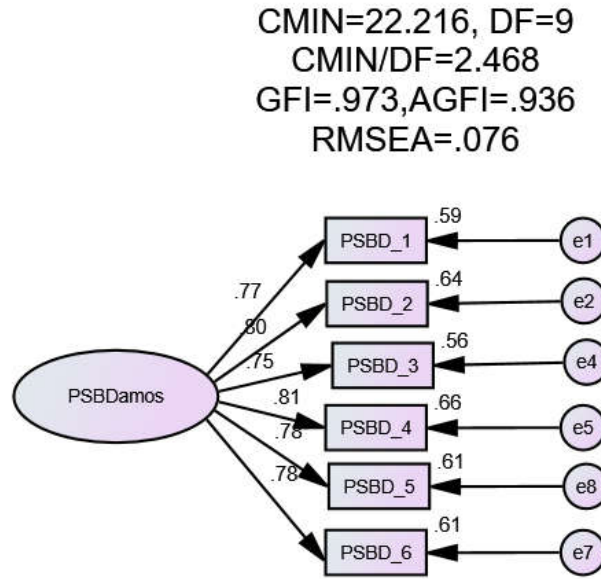


Figure C.6 1st time CFA of PSBD

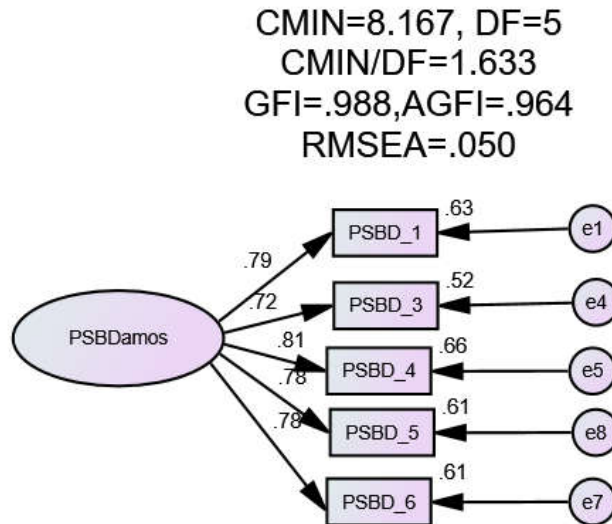


Figure C.7 Final CFA results of PSBD

Table C.12 Convergent Validity of the Scale Measuring PSBD

		C.R.	P	St Estimate	SMC	1-SMC	CR	AVE
PSBD	PSBD_1			0.791	0.626	0.374	0.884	0.605
	PSBD_3	11.946	***	0.724	0.524	0.476		
	PSBD_4	13.613	***	0.81	0.656	0.344		
	PSBD_5	13.044	***	0.781	0.61	0.39		
	PSBD_6	13.051	***	0.781	0.61	0.39		

Table C.13 Dimension Examination of each variable

Variable	No. of PCs	Proportion of Variance Explained (%)	KMO value	p-value for Bartlett's test
PC	9	71.103	0.887	P-VALUE<0.01
PG	8	64.318	0.946	P-VALUE<0.01
OP	4	64.25	0.801	P-VALUE<0.01
PSEF	4	66.643	0.805	P-VALUE<0.01
PSBD	5	68.352	0.876	P-VALUE<0.01
RG	14	70.834	0.931	P-VALUE<0.01

Table C.14 PCA results of project characteristics (PC)

Items	Principal Components		
	OC (Project Owner Characteristics)	EC (Project Environment Characteristics)	CC (Project Contractor Characteristics)
X13	.811		
X14	.803		
X11	.743		
X6		.812	
X10		.783	
X8		.719	
X16			.853
x9			.785
X15			.686
Note: values less than 0.5 excluded.			

Table C.15 PCA results of project governance (PG)

Items	Principal Components	
	project governance (PG)	
PG5		.826
PG9		.823
PG6		.816
PG3		.814
PG8		.796
PG7		.793
PG4		.776
PG1		.768
Note: values less than 0.5 excluded.		

Table C.16 PCA results of opportunism (OP)

Items	Principal Components	
	opportunism (OP)	
OP1		.816
OP2		.809
OP3		.803
OP4		.778
Note: values less than 0.5 excluded..		

Table C.17 PCA results of project efficiency (PSEF)

Items	Principal Components
	project efficiency (PSEF)
PSEF4	.842
PSEF3	.816
PSEF2	.810
PSEF1	.798
Note: values less than 0.5 excluded.	

Table C.18 PCA results of project business development (PSBD)

Items	Principal Components
	project business development (PSBD)
PSBD_4	.849
PSBD_1	.836
PSBD_6	.831
PSBD_5	.826
PSBD_3	.790
Note: values less than 0.5 excluded.	

Table C.19 PCA results of relation governance (RG)

Items	Principal Components			
	Trust (TR)	Information Exchange (IE)	Solidarity (SO)	Flexibility (FX)
TR6	.769			
TR3	.764			
TR5	.764			
TR4	.738			
TR2	.612			
TR1	.606			
IE1		.788		
IE2		.778		
IE3		.739		
SO3			.786	
SO2			.782	
SO1			.730	
FX2				.805
FX1				.763
Note: values less than 0.5 excluded.				

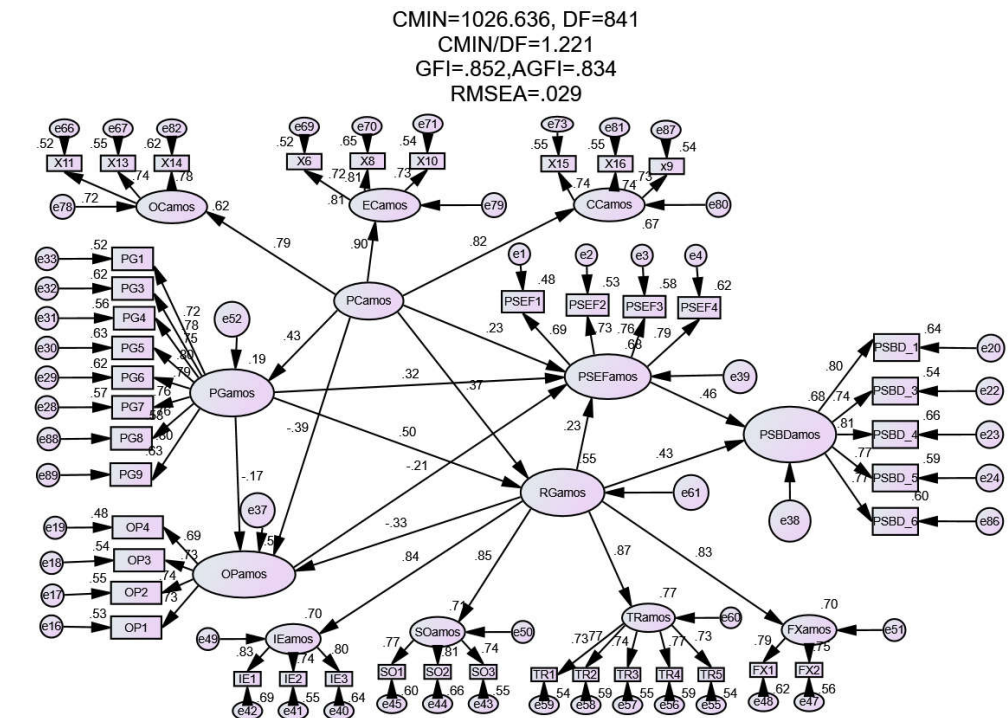


Figure C.8 the covariance structural analysis on the hypothetical model

Table C.20 Goodness of Fit of the hypothetical model

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	105	1026.636	841	0	1.221
Model	NFI	RFI	IFI	TLI	CFI
Default model	0.85	0.839	0.969	0.967	0.969
Model	RMR	GFI	AGFI	PGFI	RMSEA
Default model	0.047	0.852	0.834	0.758	0.029

Table C.21 Goodness of Fit of the final SEM model

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	103	942.473	800	0	1.178
Model	NFI	RFI	IFI	TLI	CFI
Default model	0.857	0.846	0.975	0.973	0.975
Model	RMR	GFI	AGFI	PGFI	RMSEA
Default model	0.046	0.861	0.844	0.763	0.026

Annex D: Supporting Supplement of Chapter 6

Table D.1 Estimates of relationship between project characteristics and other variables.

	Structural component				Measurement component								
Exogenous variable	Project characteristics				Project characteristics								
	PG	OP	RG	PSEF		OC		EC		CC			
Observed variable					X11	X13	X14	X6	X8	X10	X15	X16	X9
Standard coefficient	.439	-.388	.367	.233	.718	.743	.784	.723	.807	.734	.740	.744	.732
Standard error	.137	.141	.124	.140	--	.109	.105	--	.109	.101	--	.100	.107
t-value	.000	.000	.000	.006	--	.000	.000	--	.000	.000	--	.000	.000

*p < 0.001. ** p < 0.01. N/S Not significant.

Table D.2 Estimates of relationship between project governance and other variables.

	Structural component			Measurement component						
Exogenous variable	Project governance			Project governance						
	OP	RG	PSEF							
Observed variable				PG1	PG3	PG4	PG5	PG6	PG7	PG9
Standard coefficient	-.183	.500	.297	.714	.787	.759	.805	.779	.750	.799
Standard error	.078	.074	.077	--	.092	.098	.095	.100	.094	.094
t-value	.024	.000	.000	--	.000	.000	.000	.000	.000	.000

*p < 0.001. ** p < 0.01. N/S Not significant.

Table D.3 Estimates of relationship between relation governance and other variables

	Exogenous variable		Observed variable	Standard coefficient	Standard error	t - value
Structural component	Relation governance	OP		-.321	.098	.001
		PSEF		.248	.096	.008
		PSBD		.430	.104	.000
Measurement component	Relation governance	IE	IE3	.802	--	--
			IE2	.742	.075	.000
			IE1	.831	.073	.000
		SO	SO3	.743	--	--
			SO2	.814	.097	.000
			SO1	.774	.092	.000
		TR	TR5	.733	.090	.000
			TR4	.765	.090	.000
			TR3	.740	.087	.000
			TR2	.768	.093	.000
			TR1	.733	--	--
		FX	FX2	.748	.090	.000
			FX1	.786	--	--

Table D.4 Estimates of relationship between opportunism and other variables

	Structural component	Measurement component			
Exogenous variable	Opportunism	Opportunism			
	PSEF				
Observed variable		OP1	OP2	OP3	OP4
Standard coefficient	-.204	.731	.739	.734	.690
Standard error	.098	--	.090	.095	.088
t-value	.031	--	.000	.000	.000

Table D.5 Estimates of relationship between PSEF and other variables

	Structural component	Measurement component			
Exogenous variable	Project success-efficiency	Project success-efficiency			
	PSBD				
Observed variable		PSEF1	PSEF2	PSEF3	PSEF4
Standard coefficient	.458	.692	.726	.759	.784
Standard error	.103	--	.101	.100	.108
t-value	.000	--	.000	.000	.000

Table D.6 Indirect effects

(Group number 1 - Default model)						
	PC	PG	RG	OP	PSEF	PSBD
PG	0	0	0	0	0	0
RG	0.351	0	0	0	0	0
OP	-0.427	-0.154	0	0	0	0
PSEF	0.673	0.193	0.067	0	0	0
PSBD	1.028	0.501	0.169	-0.111	0	0

Table D.7 Indirect effects - two tailed significance

(BC) (Group number 1 - Default model)						
	PC	PG	RG	OP	PSEF	PSBD
PG	...	...	...	...	...	...
RG	0.000	...	...	...	...	...
OP	0.001	0.003	...	...	...	...
PSEF	0.000	0.002	0.058	...	...	...
PSBD	0.001	0.001	0.006	0.083	...	...