An investigation of the influence of project organizational culture on construction project performance: A study on Vietnam

プロジェクト組織文化が建設プロジェクト履行状況に与える影響分析

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A thesis submitted in fulfillment of the requirements for the Degree of Doctor of Philosophy

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Abbreviations

ANOVA	Analysis of variance
BMA	Bayesian model averaging
BIC	Bayesian Information Criteria
BOT	Build-Operate- Transfer
BOO	Build- Own- Operate
BT	Build-Transfer
CIS	Construction Industry Structure
CFs	Critical factors
DBB	Design-Bid-Build
D/E	Design and Engineering
EPC	Engineering, Procurement, and Construction
FS	Feasible Study
GDP	Gross Domestic Product
KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicators
MOT	Ministry of Transport
OB	Organizational Behavior
PCFA	Principal Component Factor Analysis
POB	Project Organizational Behavior
POC	Project Organizational Culture
PMI	Project Management Institute
R	Project for Statistical Computing
RFP	Request for Proposal
SLO	Short Life Organization
VIF	Variance Inflation Factor
VND	Vietnamese Dong

Abstract

For years, studies have reported that construction project performance has been plagued by critical problems such as poor quality, cost overruns, time delays, unsafe execution, and client dissatisfaction**.** Several studies on the factors that affect construction project performance have been conducted over the years, such as identifying Critical Success Factors (CSFs). In fact, a number of potential factors that assist the understanding of the phenomenon of project success have been investigated individually. Culture is believed to be an essential determinant of management practice; thus, culture has recently been addressed by researchers as a key factor in project performance within the construction industry. Construction project organization is managed by multiple stakeholders who come from diverse backgrounds, which causes different human interactions and has different expectations of a project. Hence, the behaviors and/or attitudes of the individuals involved in a project are complicated and significantly influence project success. The cultural factor is believed to generate differences in participant behavior. Misunderstandings between people and between businesses can result from cultural differences, which in turn can lead to conflict and dissatisfaction among construction project participants and create conflicts relating to human interactions, which decrease organizational capacity to achieve project objectives. It could argue that, in project management, culture should be considered a significant factor in managing conflicts, enhancing quality outcomes, and promoting innovation. However, the role of project organizational culture remains unclear because there are insufficient studies that focus on finding empirical support for the supposed positive relationship between culture and project success. Therefore, the cultures that are best suited to the peculiar nature and needs of the construction industry have not yet been identified. This research was thus undertaken to clarify the impact of project organizational culture on project performance.

Adopting the theories of organizational behavior and defining cultural orientations from the perspective of work-practice based, a quantitative research methodology was introduced. A questionnaire survey was conducted to develop a conceptual framework for project organizational culture and to examine the influence of the project organizational culture on project performance. Analysis revealed five principal dimensions of project organizational culture which are *goal alignment and trust, contractor commitment, cooperative orientation, empowerment orientation and worker orientation.* With the exception of empowerment orientation, the other four dimensions of culture were found to be significantly associated with project performance outcomes. These associations were modeled using multiple regression, and from these models it can be inferred that contractor commitment to contract agreements is the

most significant cultural factor affecting project performance. Goal alignment and trust, contractor commitment, and worker orientation contribute to improved overall performance and participant satisfaction. Contractor commitment and cooperative orientation enhance labor productivity, whereas goal alignment and trust and contractor commitment ensure learning performance.

This study not only provides a critical and significant contribution to the body of knowledge on cultural influence but also assist construction professionals in implementing practices by providing guidance on how to identify key factors that affect construction project success, which will ensure the appropriate allocation of limited resources. It would be illogical to devote resources to cultural change initiatives without any evidence of its usefulness in improving project performance.

Keywords: *Cultural influence; project organizational culture; organizational behavior; project performance; construction industry.*

Declaration of original authorship

I declare that:

- ✓ this work is my own original efforts and save for any express acknowledgments, materials, and references cited in the work;
- ✓ this work or any part thereof has not previously been submitted in any form to any university for the purpose of assessment, publication or for any other purpose.

Signature: …….....

Date: 21 September 2016

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Dedication

This thesis is dedicated to my wife, Phuong Thao for her love and support, together with my beloved daughter, Phuong Anh and son, Luong Trung. Also, I would like to dedicate this work to my mother and father, Vo Thi Lien and Nguyen Luong Quang, for giving me their encouragement and support when needed on the way. Finally, the dedication is due to other family members for giving me help in every way possible during the course of work.

Chapter 1 Introduction

This chapter provides some introductions of the research context, the definition of the research aim and objectives. A brief explanation of the scope, methodology and main contribution to knowledge of the research is also presented and the structure or the thesis is outlined.

1.1 Background

The economy of Vietnam has achieved and maintained a high growth rate since the reform and opening-up policy in 1986, which is targeted to be a fundamentally industrialized country by 2020. The construction industry sector has significantly contributed to this growth. As such, annual investment in Vietnam's construction industry has increased sharply since the adoption of the reform and opening-up policy. However, along with the huge investment, the construction industry has been reported to deplore the poor project performance, which has been plagued by problems including poor quality, cost overruns, time delays, unsafe execution, and client dissatisfaction (Nguyen and Watanabe 2014). Therefore, the factors that potentially influence the success or failure of construction projects must be identified to improve project performance.

Several studies on the factors that affect construction project performance have been conducted over the years, and a number of factors have been further investigated individually. Very few studies on CSFs have focused on Vietnam's construction industry, and those that have typically consider this issue from the perspective of "technical sense." Culture is believed to be an essential determinant of management practice; thus, culture has recently been addressed by researchers as a key factor in project performance within the construction industry. Although multiple studies have addressed the significance of project culture (Liu and Fellows 1999; Kwan and Ofori 2001; Walker 2002), these studies are rarely supported by empirical research. Also, organizational culture is recognized as influencing performance, it is however not commonly addressed at the project level. At the same time, efforts and empirical studies intended to improve project performance have focused less on project organizational culture than on procurement route or project characteristics.

Although it is increasingly clear that cultural factors play a significant role in the construction industry, little attention has been paid to relevant cultural traits in terms of a work-practice-based approach in which shared knowledge can be measured from the practice of the industry. Instead, studies have adopted existing organizational culture frameworks. Moreover, although research on the phenomenon of culture and its effects on performance in particular could inform cultural

change, such research has thus far been disparate and inadequate. The nature of the implied relationships between project organizational culture and performance remain blurred and therefore the cultures that are best suited to the peculiar nature and needs of the construction industry have not yet been identified. Especially, the culture influence has not yet been investigated in the construction industry of Vietnam.

There still remain fundamentally unanswered questions, i.e., what is the project organizational culture in construction industry? How do these "cultural traits are originated? Are there differences of cultural orientations in different projects? Do the cultural orientations significantly influence different performance outcomes? Therefore, a study is essentially conducted to address these questions, which responses in what way and what form culture are, how it affects the performance of construction projects. These answers will not only beneficially support to the process of implementing cultural changes and redesigning organizational structures, but also provide a significant contribution to the body of knowledge on culture in construction industry based project performance. Specifically, the findings of this study will help the construction industry and academia to gain a deeper understanding of the sources of project culture and the influence of project culture on project outcomes. For the construction industry, the findings provide guidance to practitioners involved in project management activities by developing measurable controls for stakeholders' behaviors. These controls would enable practitioners to adjust their interactions with participants during project delivery to achieve better project outcomes. For academia, the study will extend the body of knowledge on project organizational culture by developing a project organizational culture framework and examining the influence of project organizational culture on project performance.

1.2 Research objectives

Based on the above background, the essential research aim is to empirically examine how important is project organizational culture in determining the performance of construction projects and the nature of this determinant, and to develop a model that will assist construction project organizations to assess, in terms of performance, the possible outcomes of their cultural orientation.

To achieve this, specific objectives are as follows:

1. To clarify the position of cultural role among understanding of the critical factors (CFs) influencing project performance;
2. To clarify what is project organizational culture (POC) in the construction context based on literature of universal culture and organizational culture knowledge;

3. To develop a conceptual framework that represents the relationship between project organizational culture and project performance;
4. To construct a project organizational culture framework, which is used for predicting project performance;
5. To examine empirically the potential relationship between each specific cultural dimension and project performance; and
6. To develop a model that describes the relationships between project organizational culture and project performance and helps to identify cultural orientations that significantly contribute to enhance the construction project performance.

1.3 Research methodology

The research methodology for this study employed both qualitative and quantitative approach. The qualitative approach is adopted to develop the theoretical conceptual framework and research hypotheses, which are derived from literature review, observations, and preliminary interviews. The study starts with a comprehensive literature review that focally examines the areas of project performance; critical factors affect performance; organizational culture and organizational behavior. This forms the basis for the development of a conceptual model of the relationship between culture and performance. A quantitative questionnaire survey of practitioners (i.e., contractors and project management personnel of clients) is followed to collect data on specific cultural attributes and performance, and analyses are conducted to investigate correlations between variables.

The data analysis is undertaken with preliminarily using descriptive statistics to provide useful insights. The further specific analyses are factor analysis, ANOVA, correlation analysis, and other statistical tests of significance. An appropriate statistical analysis software (i.e., R) is employed to support the analyses. Also, a suitable and productive modeling technique is used in forming multiple regression analyses, which helps to develop comprehensive models that depict the nature and extent to which project organizational culture influences construction project performance.

The entire process can be summarized as shown below in Figure 1.1.

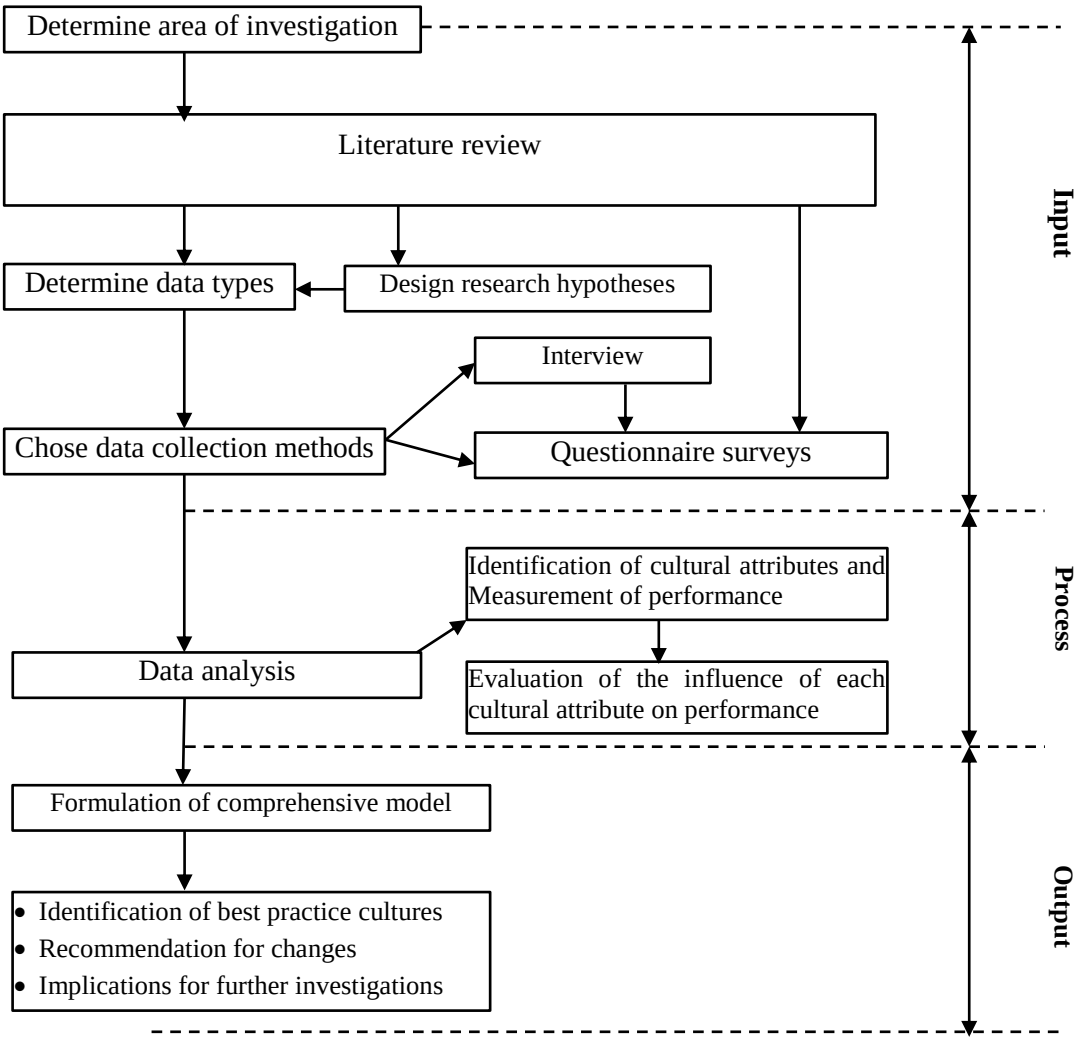


Figure 1.1 Research process

1.4 Scope of study

The problem statement and the research aims found the scope of this study. As such, the temporary project organization in terms of delivering a construction project is focally investigated in this research. The unit of analysis is thus the construction project, which is focally examined across Vietnam. This geographic focus ensures that potential variations due to the national context are controlled for and kept uniform as much as possible, and to ensure that findings reflect the general trend across Vietnam. In addition, this study is not intended to develop a completely new project organizational culture model. Rather, it intends to identify those cultural artifacts that affect the project performance at the project level. The study has developed a theoretical conceptual framework based on popularly existed organizational culture models (e.g., the models were developed by Hofstede et al., Denison., Harrion 1972, Handy., Cameron and Quinn 1999), which has critically focused on the attention of relevant cultural traits in terms of the practical context of the industry.

1.5 Outline of the thesis

The thesis consists of ten chapters that cover the whole process of the study, which is organized as shown in Figure 1.2.

Chapter 1 introduces the context within which the research is undertaken. The aim and objectives is stated. The scope and the research methodology applied are also briefly explained.

Chapter 2 presents the profile of the construction industry of Vietnam, the status quo of procurement system of the construction industry, and the factors influencing performance. In particular, this chapter seeks to highlight the poor performance and weakness of procurement system that still exists in the Vietnam construction industry. Also, there has been insufficient emphasis and empirical research on the role of culture within the project organization in enhancing performance.

Chapter 3 reviews literature on culture issue that is relevant to project organizational culture, which helps to set up the conceptual framework for the research design. Specifically, the literature review was conducted in order to develop the theoretical framework for project organizational culture. It is thus to start with the cultural studies in general; at the organizational level; and the previous studies on the project organizational culture.

In Chapter 4, the discussions focus on the development of a conceptual framework of the relationship between project organizational culture and performance and on the development of appropriate hypotheses. Also, empirical evidence based on data collection is offered for testing of the hypotheses.

Chapter 5 presents the research methodology adopted for undertaking this study. Arguments are presented justifying the choice of qualitative and quantitative approach. The data collection and data analysis are explained.

Chapter 6 discusses the characteristics of the projects that were surveyed, and also presents an analysis of the data on project organizational culture. Further, an evaluation of the relationships between the cultural orientations and the project characteristics and procurement approach is also conducted as assessing the role of the predecessor's aspects on successor which is proposed by the conceptual framework.

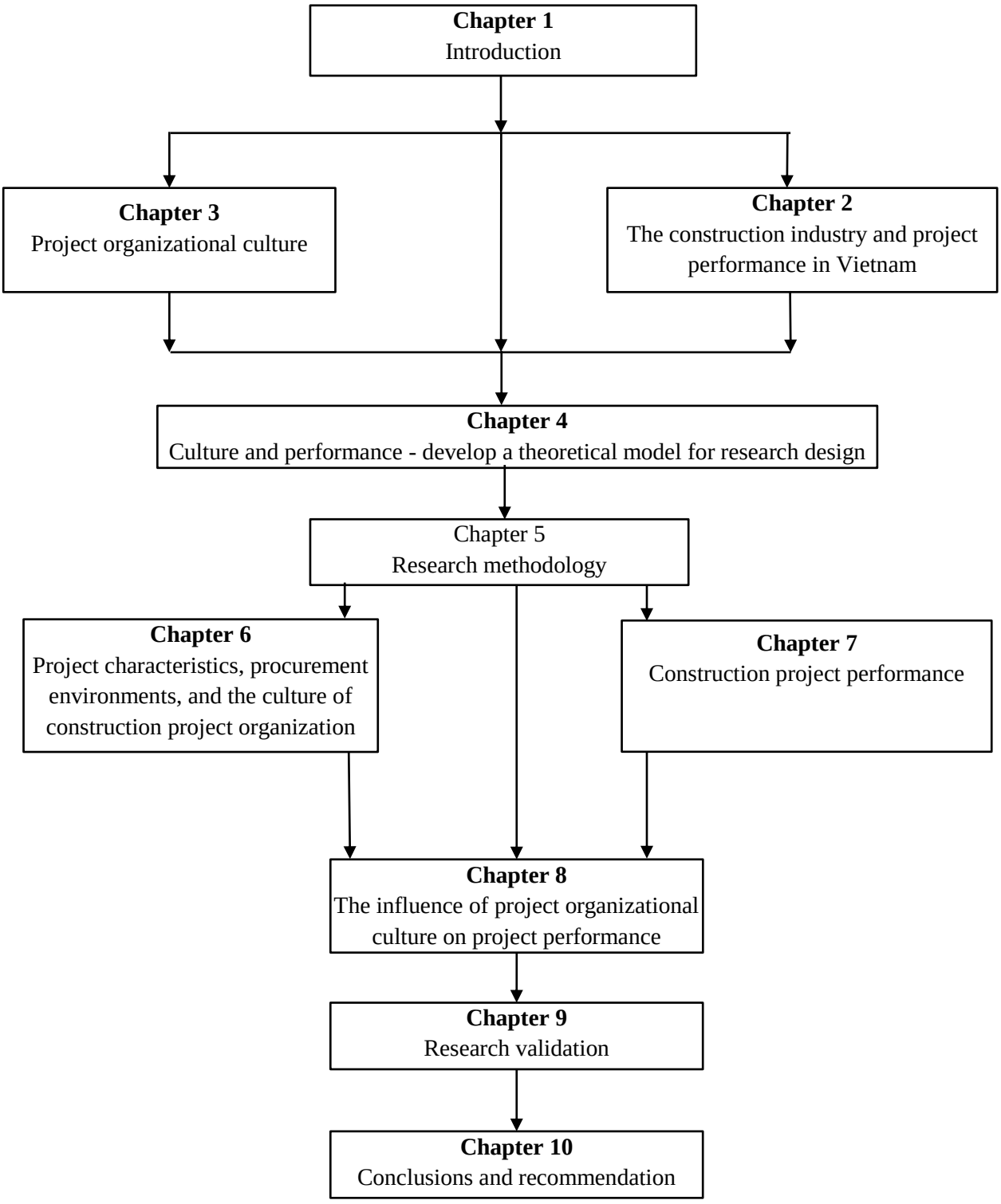


Figure 1.2 Structure of the thesis

Chapter 7 assesses the performance of construction projects in the Vietnam, where performance is the degree to which the project objectives are achieved. The performance of the construction project was assessed on the basis of the various outcomes pursued by stakeholders. As discussed in chapter 4, this research adopted eight primary performance indicators including satisfaction of client with quality, satisfaction of client with timeliness, satisfaction of client with cost, satisfaction of client with safety and environment, satisfaction with profitability, labor

productivity, lessons learned, and overall performance. Discussions on these various outcomes are presented in this chapter.

Chapter 8 investigates the extent to which the differences in cultural orientation are associated with the differences in performance outcomes. The potential relationships between the project organizational culture and the project performance outcomes are explored, determining whether or not any significant association exists. A model of the relationships, which describes each cultural dimension accounting for (represented by the relative importance index) explaining the variation in the corresponding performance, is developed and presented in this chapter to help identify best practice cultural orientations.

Chapter 9 is thus devoted to the process of validation to confirm (or disconfirm) the findings of the research though analyzing four main aspects of validation (i.e., internal validation, construct validation, validity of statistical conclusions, and external validation).

Chapter 10 summarizes the main findings and limitations of the research. Also, some recommendations are provided to further research.

Chapter 2 The construction industry and project performance in Vietnam

This chapter captures the profile of the construction industry of Vietnam, the status quo of procurement system of the construction industry, and the factors influencing project performance.

2.1 A profile of the Vietnam construction industry

Vietnam, as a developing country, has achieved and maintained a high economic growth rate since the adoption of the reform and opening-up policy known as Doi Moi in 1986. The structure of economy has been targeted to shift towards industrialization and modernization by 2020. According to General Statistical Office, annual investment in construction industry has increased sharply since 1986, showing in Figure 2.1. The data indicates that the construction industry had increased gradually during the period of twenty eight fiscal years. It is also expected to maintain this trend in following years.

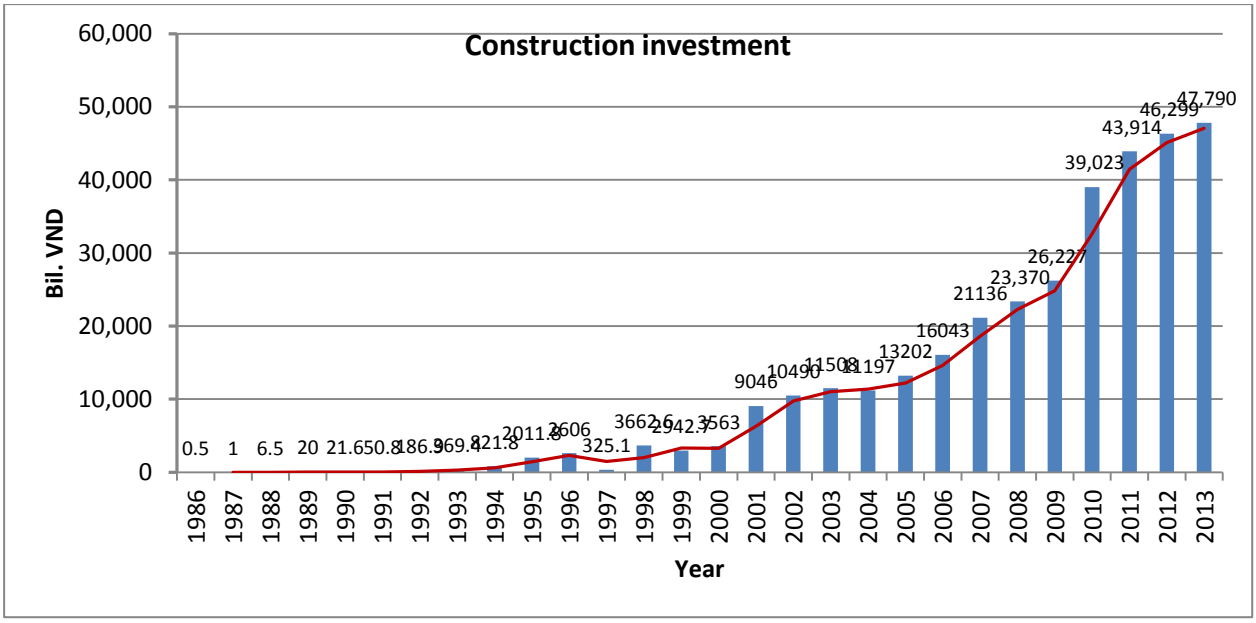


Figure 2.1 Construction investment by the Vietnam government during 1986 to 2013 (Source: *General Statistical Office of Vietnam*)

Buildings

Urbanization rate in Vietnam is increasing, which in turn forces to develop civil construction sector. As such, the process of urbanization is one of the important factors in the formation and development of new urban areas and urban projects (i.e., buildings).

The new urban areas initially developed in 1990 with about 500 municipalities and the rate of urbanization maintained about 17-18%. This figure rose to nearly 650 in 2000, increased sharply

to 870 up to the end of 2015, is forecasted to reach 1000 by 2025 (Hoang and Doan, 2015). The urbanization rate reached 35.7% for 2015 with the average growth of 3.3% per year in the period 2010-2015. The buildings with 15-30 stories appeared significantly in the years of the decade from 1990 to 2000. Tower buildings have been constructed since 2000, which are as the symbol of economic growth and the face of urban architecture, creating urban accents in the twenty-first century.

Vietnam's urban population is growing by about one million people per year, with much of that growth concentrated in mega cities (e.g., Ho Chi Minh City and Hanoi). It is likely that growth of Vietnam's rural population will level off in the next five to ten years, with all new population growth being expressed as larger urban populations. According to the decision No. 2127/QĐ-TTg of Prime Minister of Vietnam in 2011, the national strategic development of residential building was approved to which the floor area is expected to 29 square meters per capita by 2020. This figure was approximately 22 square meters per capita and 4.5 square meters per capita by the end of 2015 and 2010, respectively.

Infrastructures

Construction industry sector has significantly contributed to the total growth, and in order to maintain the level of development, the infrastructure system needs to be appropriately erected to serve that development. In practice of Vietnam, the public work investment sector has been playing a vital role in infrastructure systems such as road infrastructure networks. Therefore, public works procurement has received much attention in the social community; especially, in low income countries, while there is insufficient budget to cover the infrastructure system investment.

As mentioned, the investment of infrastructure works contributes significantly to the construction industry and GDP growth as well. Infrastructure investment in Vietnam annually accounts for 9-10% GDP (Alfen et al. 2009); however, both World Bank and Asian Development Bank advised that the investment in infrastructure should be reached to 11-12% of GDP in order to maintain the current growth rate (Lovells LLP, 2009). Clearly, there is a strong connection between infrastructure investment and Vietnam’s economic growth.

Roads and Highways:

According to the data updated by Asian Development Bank, Viet Nam has 256,000 km of roads, of which around 17,000 km are national highways and 23,000 km are main roads. Local and paved roads account for around 85 percent of the network, up from 47.6 percent in 2007 and 23.5 percent in the early 1990s (ADB, 2013). Regarding the condition of road network, 43 percent

and 37 percent of the road network are reported at good and average performance, respectively; while 20 percent of that is in poor or very poor performance. It is also reported that local roads (eg., provincial road) are narrow and unpaved, and easily vulnerable to adverse weather conditions (i.e., heavy rainfall, flood and landslide). Although Vietnam's national road strategy has been paying attention on rehabilitation, repair and maintenance, improvements have been driven by the construction of new roads rather than maintenance of existing capital stock as routine maintenance is under-funded (WB, 2014).

Railways:

The national railway network has been significantly invested since 2000, which mainly focuses on improving, repairing and maintaining of permanent ways and rolling stocks although the total of 3,142 route kilometers in 2000 fell to 2,347 route kilometers by 2011 and no new routes were opened (Asian Development Bank, 2013; Ministry of Transport, 2010). The railway network is operated and managed by a government railway enterprise.

According to Asian Development Bank's report, the Strategic Framework for Connecting Greater Mekong Sub-region (GMS) Railways was endorsed at the GMS Ministerial Conference. The countries of the GMS including Cambodia, the People's Republic of China (PRC), the Lao People's Democratic Republic (Lao PDR), Myanmar, Thailand, and Viet Nam noted the need to look into developing the GMS railway network to enhance connectivity between the six countries and to include railways in the scope of GMS cooperation (ADB, 2010). Part of the plan compromises a new high-speed rail network in Vietnam with an expected funding gap of up to US$64 billion (Duong 2014). It is also noted that the funding gap will be covered by the responsibility of government together assistances which will be sought from multilateral agencies and the private sector.

While the railway master plan has identified the investment priorities, it seems being sluggish paces in reforming rail sector that is able to attract multiple sources for the investment, which in turn reduces the financial burden on the governmental expenditure.

Ports:

Viet Nam has approximately 3,400km of coastline along one of the world's busiest sea cargo lanes, and has ambitions to compete with Singapore and Hong Kong on the provision of sea cargo services. It is reported of over 80 seaports that service both trade and fishing industry. The larger ones have traditionally been developed by government, and handed over to the country's state-owned port and shipping company operator, Vinalines, for operation (World Bank, 2014).

It is also noted that Viet Nam has no deep-water port. As such, exports are usually transshipped to Hong Kong or Singapore before dispatching to foreign markets (Duong 2014). The country's infrastructure is thus planning with including projects of the feasibility of having a deep-water port.

Airports:

There are 135 airports/airstrips in Vietnam (World Bank, 2014), and aviation transport was responsible for 6.9% of fuel consumed in the transport sector in the country in 2005 (RCEE and Full Advantage, 2009). The existing international airports are being improved; on the other hand, a new airport is under executing the feasibility study (i.e., Long Thanh international airport) to replace the Tan Son Nhat international airport, the current biggest airport of Vietnam, which is under excessive traffic. Upgrading major airports is necessary in assisting Vietnam to compete with rival destination cities in the ASEAN region and to maintain its growth in international tourism.

Power:

It was reported that energy consumption of Vietnam sharply increased from 98 KWh to 1,035 KWh per capita in the period of 1990 to 2010. The main sources of power are natural gas (46%), hydropower (29%), coal (21%), and oil (4.2%) (Asian Development Bank, 2013). A significant capital has been expended in energy generation infrastructure in Vietnam that attempts to keep up with the increasing of energy consumption. It was reported that annual power sector investment during 2005-2010 was expected expenditure to cost over US$3 billion (World Bank 2006). Although the government has been made great efforts in attracting and encouraging private sector beside the public expenditure to the energy investment, power blackouts and insufficient energy supply during periods of peak load are expected to increase as a result of the anticipated gap between demand and supply in 2015 and onwards (Duong 2014).

Vietnam has established a good foundation for the coming massive capacity expansion program with the development of the Sixth Power Master Development Plan, covering 2006-2015, with a view to 2025 (World Bank 2006).

Priority Sectors

According to The 2012 Global Competitiveness Report, Vietnam' infrastructure was poorly rated, particularly for the quality of road and port facilities (World Economic Forum, 2012). The early priorities of the government are thus on improving road, port, and energy infrastructure services. In 2011, the government adopted a five-year Socio-Economic Development Plan to

which increasing the infrastructure investment is a central emphasis. The strategies were designed based on expenditure for infrastructures including the transport, energy, irrigation, and information and communications technology services that helps to sustain future economic growth and accelerate Viet Nam's social and industrial development. Urban development, industrial and commercial infrastructure, and services in education, health and cultural activities are also emphasized. It is noted that an estimation of around US$16 billion annually is needed for these objectives, while only 55 percent of that requirement is available (Duong 2014).

The Vietnamese government recognizes that development of the transport sector is critical for economic growth and development, and that investment in transport can pave the way for wider investment flows. Demand for freight and passenger is expected to respectively increase by 7.3 percent and 12 percent annually during 1990 to 2030 (Ministry of Transport, 2007). The investment for transport infrastructures requires 4.1% of GDP per year (Alfen et al. 2009). The total current length of road networks in 2011 in Vietnam shows that most of the road types are ongoing erected to support the development process (Fig. 2.2).

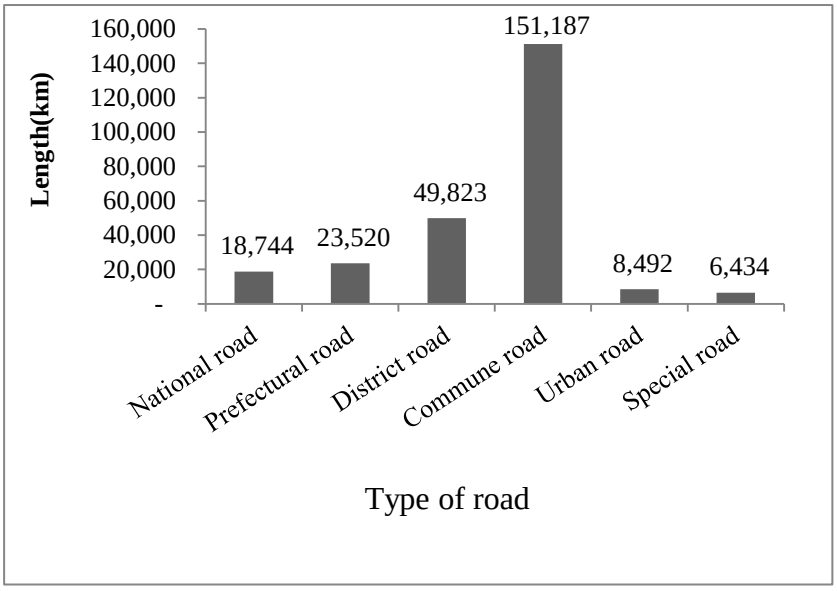


Figure 2.2 Vietnam road network 2011 (Source: Directorate for roads of Vietnam)

According to the report of Directorate for Roads of Vietnam, an amount budget for this plan is required about 1.619.226 billion VND (approximately US$77 billion) in ten years investment from 2010 to 2020, which is attributed to about 202.308 billion VND (approximately US$9.63 billion) per annum, as seen in Figure 2.3.

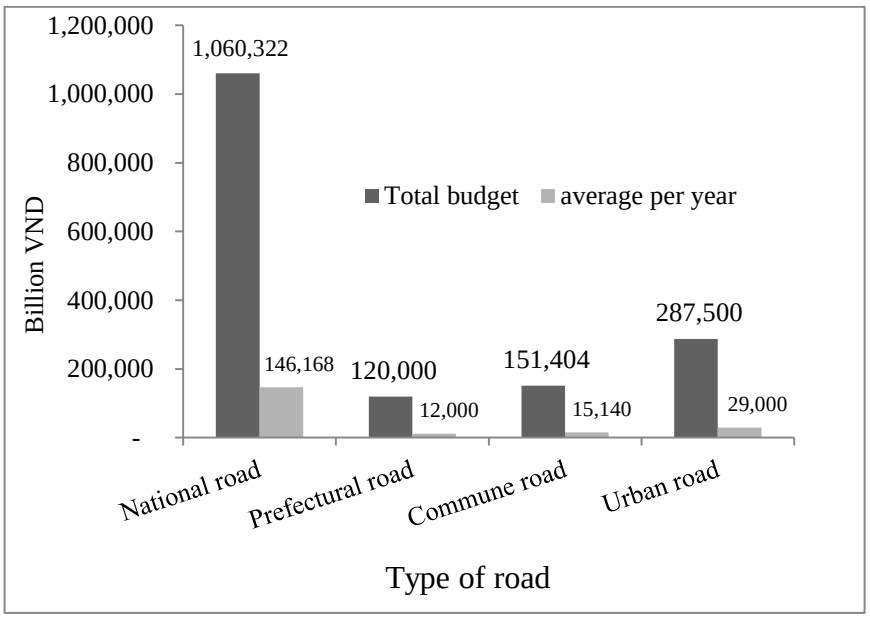


Figure 2.3 The capital demand for road networks development in Vietnam until 2020 (Source: Directorate for roads of Vietnam).

The data indicate that a great amount of budget for the national road networks investment such as highway express is needed during the decade by 2020. The Vietnam government has approved new highway projects with estimated 2,160 km, which is known as a part of the national Transport Master Plan that has been implemented in the period of 2008 to 2020 (ITC report 2010). The plan also includes the construction of two subway systems in Hanoi and Ho Chi Minh City at a cost of US$15 billion. So far, public share has regularly played a major role in financial resources for these investments; actually, budget for transportation infrastructure development accounts for 98% of the total capital expenditure in the last decade (Alfen et al. 2009). Therefore, the Vietnam government has a very strong commitment to develop and modernize the national transport infrastructure systems since it is expected that such development will noticeably support economic growth.

2.2 Weaknesses of the Vietnamese construction industry

The construction industry is known as project-based (Fellows et al. 2002). As such, project performance is commonly blamed for industry problems. To assess the sources of project performance issues, it is useful to examine the processing of a project life cycle. In this process, risks could be generated as of either technical or managerial aspects, which embed in the preceding stages affecting directly to the succeeding ones (Nguyen and Watanabe 2014) (Fig 2.4). The technical risks are recognized in most of the activities such as concept planning, design developing, request for proposal preparing, construction executing and operating during project delivery. Along with, managerial risks are created as a result of human's biased decision-making

on each phase due to insufficient information, unaccountability, inappropriate direction, improper management, inadequate control and unnecessary intervention. Decision making happens in each constituent part, and almost decisions are obtained by uncertainty associated with further events; risk is typically intrinsic in projects. Project decision-making occurs in the perspective of the project stakeholders (Edwards et al. 2005).

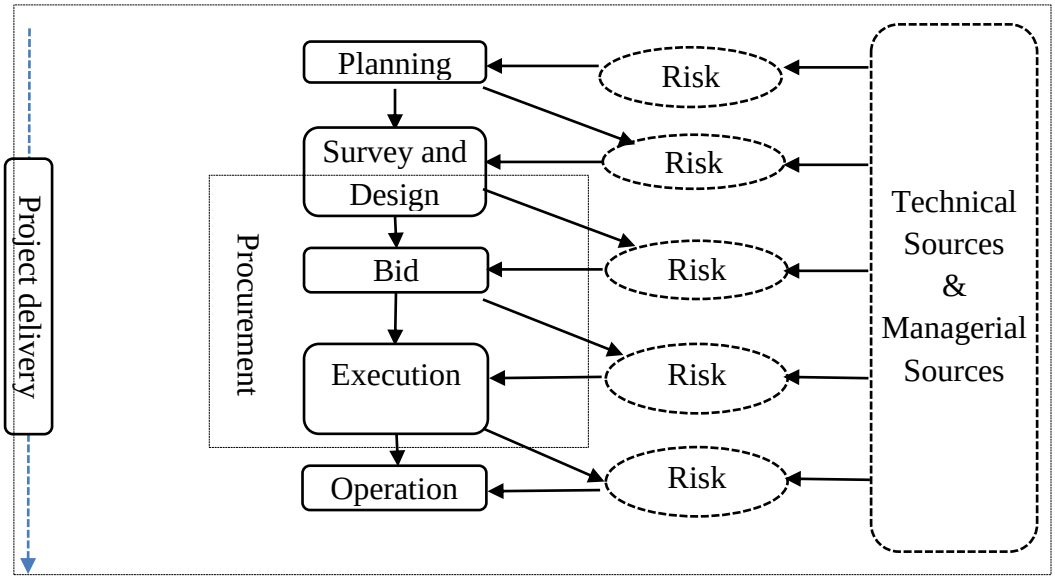


Figure 2.4 Risk sources generated in the project life cycle

(source: Nguyen and Watanabe 2014)

On the other hand, along with the massive increase in construction investment, the construction industry in Vietnam has been challenged with a number of critical issues related to project performance, which has been plagued by problems including poor quality, cost overruns, time delays, unsafe execution, and client dissatisfaction (Nguyen and Watanabe 2014).

To investigate the status quo of the construction industry, based on both working experience and observation by the author, weaknesses of procurement system were obtained as hypotheses. The validation, solid identification of hypotheses, consists of literature reviews, additional observation of existing conditions and 15 complete packages of road and bridge in Vietnam, and the questionnaire surveys. The surveys were conducted with 124 respondents in between February 2014 and March 2014. 124 respondents of stakeholders were working for client organizations (40 respondents), contractors (53 respondents), consultants (19 respondents), academia (7 respondents), and 5 other respondents. The Construction Industry Structure model was then employed to explain the current construction industry characteristic of Vietnam. The survey results are summarized in Table 2.1 as follows.

Table 2.1 Summary of survey results

No.	Questions	Agree	Dis-agree	Others	Chisquare test	
					χ-square	P-value
1	Difficulty to receive the Request for Proposal due to obstruction in the case of collusion	82%	18%	0%	140.725	<2.2e-16
2	Poor quality of Request for Proposal	85%	14%	1%	150.596	<2.2e-16
3	Lack of independent and trustworthy reference information of contractors.	83%	15%	2%	141.500	<2.2e-16
4	Low trust between client and contractor in bidding process and execution	77%	18%	5%	111.548	<2.2e-16
5	Information of projects is not provided conveniently.	71%	28%	1%	93.016	<2.2e-16
6	Prevailing collusion is a cause of low competition.	81%	18%	1%	134.532	<2.2e-16
7	Many poor design document is still an issue, resulting in change orders during construction	87%	12%	1%	163.661	<2.2e-16
8	Past performance of contractor is still not considered or ineffectively evaluated	89%	10%	1%	172.854	<2.2e-16
9	Risk assessment plan of contractor is still not considered effectively	83%	16%	1%	142.371	<2.2e-16
10	Key persons of contractor are not effectively considered.	89%	10%	1%	172.854	<2.2e-16
11	Sub-contractors and suppliers are still not focally evaluated	76%	23%	2%	108.837	<2.2e-16
12	Cost overruns and time delays are common phenomenon	93%	7%	0%	90.612	<2.2e-16
13	Poor quality of works is confronted due to collusions	69%	28%	3%	84.790	<2.2e-16
14	Contractors are placing on profit margin rather than quality of works.	75%	23%	2%	104.435	<2.2e-16
15	Quality control and quality assurance of contractors are still poor condition	73%	24%	3%	98.338	<2.2e-16
16	Low trust among participants (i.e., client, consultants, and contractors)	78%	17%	5%	111.548	<2.2e-16
17	Collusion is existing problem during the project delivery	85%	13%	2%	154.129	<2.2e-16
18	Payment delays by client are prevailing that threats either contractors' finance or timeliness of project delivery.	83%	15%	2%	141.500	<2.2e-16

2.2.1 Existing problems in feasible study phase (FS)

This is the initial phase in a project life cycle; thus, its performance influences significantly on following stages. However, a large number of projects were reported under poor quality, i.e., insufficient studies on environment, geography, and utilized capacity of project; which results in inappropriate project delivery with its actual demands (Do 2012; Hoang 2012). It was also

reported that the poor performance project caused by issues relating to various stages of project life cycle; especially, the poor design works are conducted at the feasible study step. As such, poor fundamental design works not only affect the project quality but also lead to the adjustment of project capacity to which time consuming and/or costly solutions are needed to apply. The feasible study step also plays the significant role in determining the preliminary budget of project which is used for financial plans of each fiscal year. However, the actual expenditure of projects delivered as observed was exceeded its initial planning budget indicated in the FS documents and the contracts. This phenomenon is attributable to the insufficient competence of consultant entities that are responsible in cost estimating. In addition, the inaccurate initial design is the source of claims making, i.e., change orders in execution step that creates additional works. This is supported by the survey result to which 87% of respondents agree with the statement that "many poor design documents are still an issue, resulting in change orders during construction" (Table 2.1)

2.2.2 Existing problems of Design and Engineering (D/E) phase

In the D/E step, the design document is produced based on the fundamental design of the FS phase. Thus, in this step, architectures, structures, technologies and specifications of project are specifically described, that facilitates the executing on construction site. According to the statistical data of collapsed constructions of the state authority for construction quality inspection (SACQI), it was noted that the quality design was documented as the essential cause for most of the damaged and collapsed works. Particularly, for projects funded by public budget which were criticized by insufficiently controlled regulations in surveying, designing, and estimating; as a result, this creates not only errors but also financial wastage and loss in the construction investment.

In addition, many design documents are blamed for using poor survey data (i.e., inadequate quantity or poor quality), misspecification, and inaccurate standards that are provided by client (Do 2012; Hoang 2012; Pham and Hadikusumo 2014). This reusing entire data collected from the feasibility study step (i.e., survey data) is explained as cost saving. However, the consequence of this approach is insufficient quality of design documents which affects directly to the execution.

Another phenomenon observed, the design documents do not provide appropriately and/or indefinitely the technical specifications of materials used. As such, contractors likely deliver low quality materials that help to increase their profit margin. This phenomenon makes inspectors, on the other hand, difficult in clarifying the qualified specifications. It is also noted that the design documents are criticized in describing impractically executing technologies, causing the poor

request for proposal (RFP) document without an appropriate constructing technologies and executing specifications).

2.2.3 Existing problems of bid phase.

In practice, a number of regulations on procurement have been enacted by the Vietnam government in the last two decades (Fig. 2.5), and some of drafting guidance law has been discussed to soon publication. However, the regulation namely "public procurement" has not ever been issued so far; it was the tender regulations instead, and these rules were adopted as the public procurement law. Although first regulation was launched in 1989 (Fig. 2.5), there was not any comprehensive and open competitive bidding regulations until 1994. The founding process of a modern procurement framework for public expenditures, based on principles of competitive bidding, was begun after the first procurement review in 1994. The regulations were separately developed for capital investment and recurrent expenditures. On the capital investment works were done under technical assistance grants provided by World Bank and Asian Development Bank (ADB). Given those assistances and hands-on experience, the regulations have steadily improved. As requests of the National Assembly, under conducting of the inter-ministerial members group led by the Ministry of Planning and Investments (MPI), tender regulations have been severally issued then revised and substituted since they were first formally enacted in 1996 (Fig. 2.5). The latest regulation is the Tender Law imposed in 2013 which substituted the prior regulations. The latest Law shows some significant improvements in comparison to the first regulation imposed in 1989, making the tender procedures more detailed and approaching to internationally common procedures.

Objectives of the tender law confirmed in its commencement statement are to guarantee four bidding principles including competitiveness, fairness, transparency, and efficiency. The Law also provides for a number of different procurement methods described as follows. Firstly, open competitive bidding is compulsory for most of procurement of goods, works, and consulting services above certain financial thresholds; and there is no restriction on the number of participants. Secondly, designated competitive bidding, which requires a direct invitation to at least five candidates, can merely be utilized in one of the following situations: (i) The procurement is for a research or an experimental nature and only a few bidders have the capability to implement; (ii) under the requirement of the foreign donors; and (iii) the highly specialized procurement. Thirdly, appointed bidding which is used as the given special circumstances for goods, works, and consulting services that require urgent action to respond to an event of force majeure; or involve goods or services from a supplier that cannot be switched to other suppliers due to the technologically compatible requirement; or involve the national

security and energy security. Additionally, the appointed bid can solely be employed for procurements below certain financial thresholds. Finally, the special cases may be applied if none of those methods could be used and it also needs to get the approval of the Prime Minister.

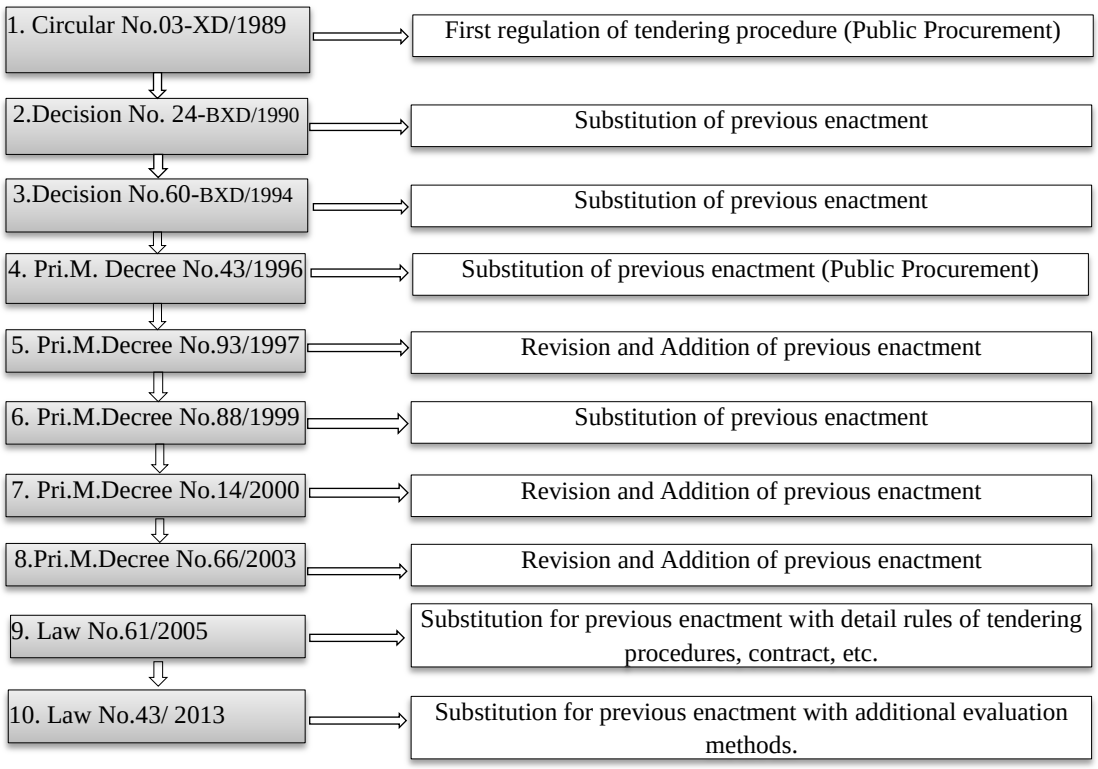


Figure 2.5 Changing procedures of public procurement regulation in Vietnam**.**

Table 2.1 shows results of the questionnaire survey. Summarizing results of this survey, the above stated four objectives of the procurement law are not considered to be achieved. Main problems usually result from insufficient promulgation of tender regulations form, inappropriate bid scheme, impractical evaluation method, insufficient responsibility fulfillment by each level of management in each organization, and insufficient public information disclosure. Law 2005 first introduced an unique evaluation method, which was the price based on "an equal footing basic" in which multiple criteria including that technical and commercial evaluations are converted into the total price proposal; however, it appears to be impractical.

In addition, the latest tendering law offered two more evaluation methods, namely "lowest price based" and "technical criteria combined with financial criteria based weighting." Here two survey results should be noted. First, 82% of respondents agree to the problem statement of "Difficulty to receive the RFP due to obstruction in the case of collusion." This shows that collusion phenomena are prevailing. Second, 85% of respondents agree to the problem statement of "Poor quality of Request for Proposal." This hints that RFP gives ambiguous introductions and poor definition of evaluation criteria. Thus, the low bid method has been the most likely

employed in bid processes. As for another actual concern, a comprehensive evaluation method, in which multiple criteria are effectively inclusively evaluated, has not been defined by the existing tender regulations; consequently, clients could not have the legal frame to implement that method in the Request for Proposal and evaluation. Therefore, bid decisions are usually based on lowest price; as a result, the awarded bidder is forced to make high profit margin by providing cheapest construction services or making more claims as much as possible. Subsequently, poor public works performance is a natural consequence.

In order to capture issues visibly, the open competitive bidding process is described in Figure 2.6. It can be seen that most of stages of procurement process have specific problems caused by both involved stakeholders (software) and structured system (hardware).These issues at each stage are discussed as follows.

Lack of information reference systems of bidders

83% of respondents agree to the problem statement of "Lack of independent and trustworthy reference information on contractors." The capacity and past performance of candidates cannot be effectively and conveniently verified. Consequently, in practice, qualification of each bidder is only judged from documents submitted in each bid proposal. In addition, the qualification documents submitted, which includes only a financial statement confirmed by a private audit firm and a list of completed contracts in the past, is not assured by any bid bond or a third party. It implies that contents of most qualification documents are questionable and that clients cannot effectively verify the capacity, experience and performance of each bidder. Thus, 77% of respondents agree to the problem statement of "Low trust between client and contractor in bidding process and execution."

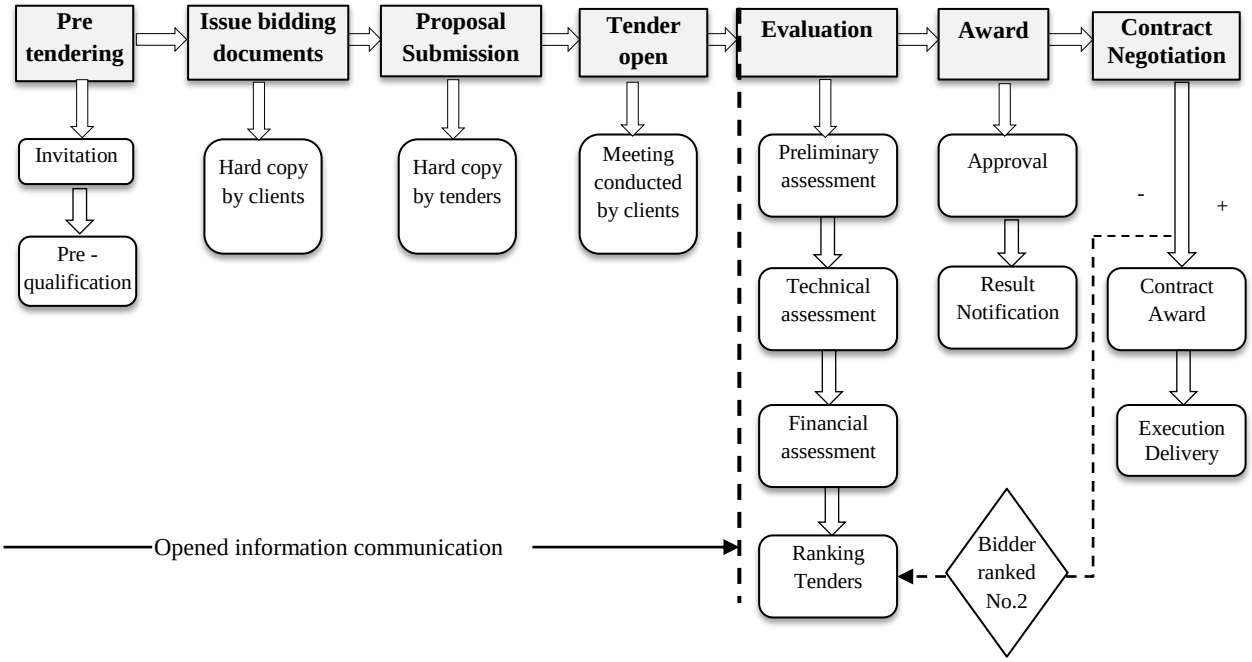


Figure 2.6 Open competitive bidding process in Vietnam

Designated competitive bidding

The designated competitive bidding is conducted in most projects even if a project is announced an open competitive bid. As mentioned above, the law offers a certain number of selection methods including open competitive, designated competitive, negotiated, and purchased biddings; however, 81% of the respondents agreed to the problem statement of "Prevailing collusion is a cause of low competition," that is, the selection mechanism is attributed to an "easy" practice of less competitive approaches involving collusion. Given such a restricted competitive environment, only candidates who have good relationship with clients or top management positions of public authorities can participate in certain bids. Furthermore, there is one more important survey result. 82% of respondents agree to the problem statement of "Difficulty to receive the RFP due to obstruction in the case of collusion." This behavior means that the public client makes pre-bid information unavailable to certain bidders including bid invitation information and Request for Proposal document. These techniques preventing open competition are widely employed. As a result, the open competitive bid approach is certainly not competitive enough because bidders can be successful by having a good relationship with the client rather than improving their competitive capacity. Therefore, practices of restricted competition are conflicted with stated objectives of the law.

Lack of transparent and convenient information system of bid process

71% of the respondents agree to the problem statement of "information of the certain projects is not provided conveniently." The adequate and timely notification of bid opportunities is a cornerstone of transparency in procurement. Moreover, information publication and openness in regulations should be available in not only the tender announcement but also the myriad of other contents such as evaluation criteria, scoring criteria, and evaluation method. It is also criticized on keeping confidentially the "ceiling price" of bid packages (i.e., public engineer's price) that in turn forces bidders usually to tend to exploit the package's price information from clients or client's representatives. Naturally, the more confidential clients keep information, the more curious bidders exploit; consequently, that lack of transparency is a source of bidding collusion and corruption.

Here it should be worthwhile mentioning Japan's experience. Japan has been suffering from the same unfair activities associated with confidentiality of the ceiling price. Thus, many local governments disclose the ceiling price before the bidding. Some governments even disclose the lower limit on contract value. These measures are certainly effective to reduce corruption; however, there is a side effect. Most of bids concentrate on or around the lower limit; thus, a winner is often determined by tossing a coin. This measure may be hindering development of truly excellent contractor; however, an epoch making measure to prevent unfair behavior and promote truly excellent contractor has not been found yet (Watanabe *et al.* 2012). There seems no almighty measure. Depending on the history and the current practice of procurement, a most suitable measure should be carefully discussed, derived, implemented, and modified based on the implementation results.

To be transparent in information communication, not only should all the disclosure information requirements be satisfactory; but also such requests should be publicly explained to candidates during bidding process. However, the provided interpretations to unsuccessful bidders, for example, are insufficient to clarify the reasons. Therefore, the obvious accountability stakeholders in the bid information justification should be confirmed by regulations in order to warrant the transparency and the objectivity of all bid information.

Poor quality of Design and Request for Proposal document

87% of the respondents agreed to the problem statement of "poor design is one of major issues, which causes frequent change orders during the executing period." This becomes a fundamental reason that awarded contractor makes many claims for supplement works. As a result, the actual cost usually exceeds the initial budget of packages; consequently, budget is forced to adjust additionally after completion of works.

In addition, the Request for Proposal (RFP) document is regularly developed by consultant firms. However, risks appeared when the consultant has insufficient capability. In fact, as 85% of respondents agreed to the problem statement of "Poor quality of Request for Proposal," most of consultant firms have inadequate capability causing the poor RFP document. Certain RFP documents are completed without appropriate constructing technologies, specifications, and effective standard. Consequently, those poor criteria cannot be an accurate judgment function to assess competitors. As a result, the poor design document and the poor Request for Proposal are the critical sources and causes of change orders and supplementary work claims during construction delivery.

Issues of Bid Evaluation

Bid documents, in principle, disclose the method of bid evaluation and contract award criteria. The award criteria for goods and works are (1) minimum requirements fulfilled; (2) lowest "evaluated price"; and (3) proposal price not exceeding pre-bid estimate (ceiling price). However, the ambiguous term of "evaluated price", which is defined as the bid price after errors correction, deviations adjustment, and then the conversion of technical, financial, commercial criteria and others to make bids comparable, has not been practical or feasible. The inapplicability of the "evaluated price" technique is caused by an insufficient clarification in the Request for Proposal document. Therefore, in practice, assessors cannot apply the "evaluated price" technique even if it is ruled by the Law. Actually, the technical evaluation score is not obtained by its relative importance to price evaluation score. Generally, the lowest price proposal is awarded among those who satisfy the minimum of the technical requirements.

In addition, 89% of the respondents agree to the problem statement of "Past performance of contractor is still not considered or ineffectively evaluated." Quality, schedule over-run, warranty activities, and past client's claims are not assessed in qualification screening or in-depth assessment stage. The lack of past performance criteria evaluation is partly as a result of the untrustworthy references information of candidates. In other claims, 83% and 89% of the respondents also agreed to the problem statements of "the risk assessment plan and superintendent assessment are still not considered or ineffectively evaluated in the evaluation process, respectively." In fact, those criteria are not critically required in the Request for Proposal document. Consequently, those inadequate criteria consideration become a major cause of poor potential project performance such as time overrun, exceeding budget with change orders, and unfulfilled quality expectations. Therefore, a winner is substantially determined based on the lowest price. Furthermore, the evaluation process is not transparent enough to both bidders and

communities who can straightforwardly monitor the process in order to confirm its transparency, equality, and award result as well.

2.2.4 Existing issues of post award (PA) stage.

Execution plays as a key stage in creating the planning project which is to become physical on site. As such, it is important for stakeholders (i.e., client, supervision, and contractor) to fulfill their own commitments. However, the survey results indicated that 78% of respondents agreed with the statement of "low trust among the stakeholders". Specifically, contractors are accused by 75% of respondents that they place on their own profit margin rather than quality of works. As observed, contractors tend to apply insufficient quality of materials used or making claims for change orders to compensate for the low bid award. The survey also noted that the quality control and quality assurance of contractors are still poorly implemented. In fact, the prime contractors liberally make multi-tiered subcontracting without paying much attention to quality management on site. As a result, sub-contractors with insufficient experiences, capabilities, competencies, and responsibilities could be hired that constitutes directly to the poor quality works.

On the other hand, inspector consultants are contracted to be representative of client for implementing client's control, management, and direction with contractors' activities. However, it is widely argued that the inspector is not assigned with completely certain authorization as the representative roles. Instead, the inspector is still directed or forced by the client's interventions. As such, inspector is also blamed for the collusion involvement with other stakeholders (i.e., client and contractors).

Taken some examples of typically poor projects conducted, the HCMC-Trung Luong Highway which was invested with an amount of approximately 10,000 billion VND and commenced in late 2004 with a total length of 62 km and maximum speed of 100km. After 4 months delivering, there were many potholes and delves appeared (Fig.2.7). As the final conclusion of the Ministry of Transport (MOT), the collapsed pavement structures were accused for unfulfilling the technical requirements (i.e., unsatisfied graded components of sub-base layer due to small particles of crushed stone, unguaranteed density, and especially plasticity index exceeding the tolerance). These responsibilities were attributable to both contractors and supervision consultants.

Figure 2.7 HCMC-Trung Luong express way' pavement with potholes and delves (source:Vnexpress News)

In another case, the national project named Noi Bai-Lao Cai Highway which was invested of the budget of 26,229 billion VND and scheduled from July 1st 2009 to December 12th 2013. However, it was documented that all packages of this project were delayed because of poor performance of contractors (Table 2.1). The data indicated that most of packages of the project were delayed with 20% over comparing to the original plans. This project was mostly conducted by Korean construction contractors (i.e., Posco, Keangnam, and Doosan Corp.) who covered 6 units in the total of 8 packages. The other two remaining packages were constructed by Road and Bridge Guangxi Company (China) and a Vietnamese contractor. According to the report of Vietnam Express Corporation (VEC), who was represented of the client, confirmed that these delayed packages were completely attributable to the poor performance of contractors. The prime contractors contracted with incompetent sub-contractors who were unavailable with the financial requirements and insufficient capacities for construction works.

Table 2.2 The actual schedule at July 2013 of the Highway Noi Bai-Lao Cai

ID	**Name of packages**	**Actual accomplishment**		**Planning schedule (15/07/2013)**		**Exceeding/delay (+/-)**
		Million VND	**%**	**Million VND**	**%**	
1	A1	1,540,744	75.99	1,927,758	95.07	-19.08
2	A2	1,226,333	67.80	1,467,347	81.13	-13.33

3	A3	1,099,993	59.09	1,587,310	83.83	-24.74
4	A4	608,909	46.92	918,513	70.78	-23.86
5	A5	480,341	30.65	1,134,500	72.39	-41.74
6	A6	1,001,469	52.30	1,348,757	70.43	-18.13
7	A7	924,771	72.82	1,440,954	113.46	-40.64
8	A8	797,757	61.78	1,149,793	89.04	-27.26

Source: Transport Engineering Construction and Quality Management Bureau, Ministry of Transport

In addition, 83% of respondents also agreed with the claim that clients usually tend to postpone the payment commitment with contractors. This influences not only timeliness of project delivery but also contractors' financial circumstance. Although this phenomenon is universally reported, a productive "remedy" has not been applied to mitigate this risk yet. In fact, lawsuit options to clients seem to be impossible because most of contractors are afraid of either pursuing of the complex litigation system or affecting their relationship with clients, which is supposed to influence their own future business opportunities.

Given stated issues above, problems of procurement system and Accountable stakeholders are summarized in Table 2.3

Table 2.3 Problems in procurement system and Accountable stakeholders

No.	**Stages**	**Major problems**	**Accountable Stakeholders**
1	Pre-bid	- Poor design document - Lack of independent and trustworthy references of bidders - Bid collusion	Government and Clients
2	Bid information	- Inconvenient available information. - Ineffective criteria evaluation - Sealed up the "ceiling price"	Government and Clients
3	Request for Proposal document	- Poor quality - Minimum of specification requirements	Client and Consultant

	(RFP)	- Lack of effective evaluation criteria	
4	Evaluation method	- Many evaluation methods proposed inapplicably - Predomination of the price based method - Lack of the effective comprehensive method - Lack of past performance consideration - Lack of the risk assessment plan consideration - Ineffective superintendent evaluation.	Government, Client and Consultant.
5	Post award	- Poor performance of Sub-contractors. - Insufficient fulfillment of bid proposal commitments. - Claim for change orders - Poor quality of works, cost overruns, and time delays - Collusion phenomenon	Client, consultant, contractor.

By adopting the Construction Industry Structure (CIS) model, the current situation proves that the Construction Industry of Vietnam is located in Quadrant- I, and occasionally, in Quadrant IV , as seen in Figure 2.8.

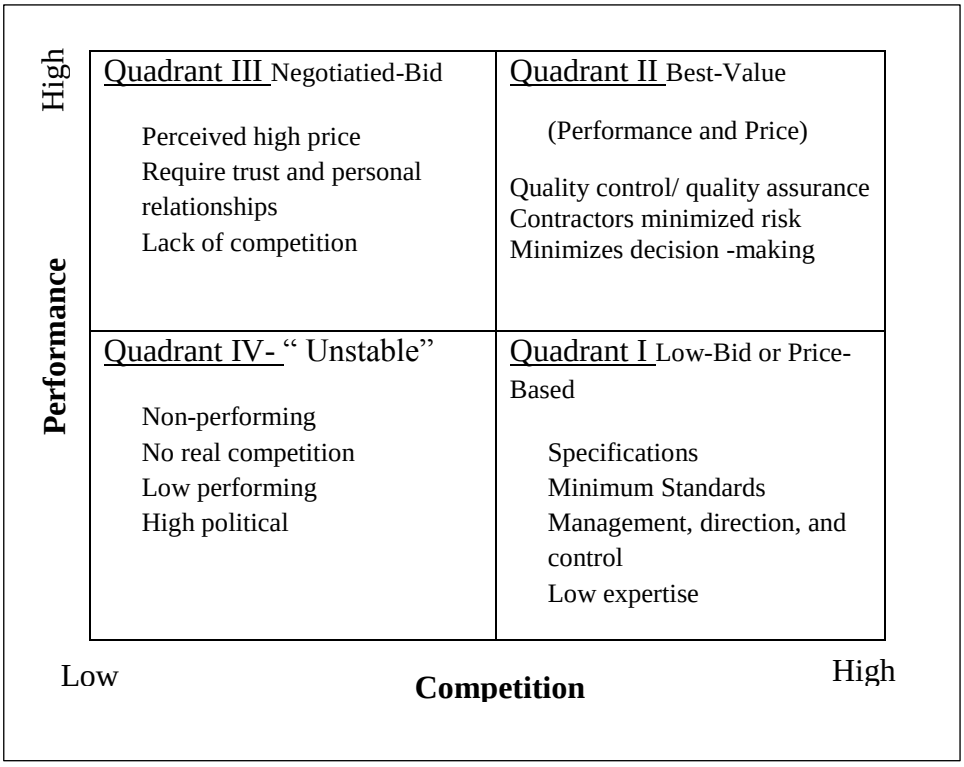


Figure 2.8 The Construction Industry Structure (Kashiwagi, 2010)

2.3 Factors influencing construction project performance

The performance of a construction project is influenced by numerous factors. Sanvido et al. (1992) defined the variables that determine project success. These factors are described in the literature as critical success or failure factors (Fortune and White 2006). Fortune and White's (2006) literature review considered 63 articles regarding the critical success factors (CSFs) of projects (including non-construction projects). At least 27 CSFs were explored, including support from senior management, clear and realistic objectives, a detailed plan that is continuously updated, good communication, user and client involvement, skilled and sufficient staff, competent project management, proven technology, realistic schedules, past experience, project size, and complexity. This list of factors augmented a previous list of 24 empirically derived CSFs in White and Fortune (2002). Chan et al. (2004) reviewed 43 CSF articles in seven major management journals and identified 44 CSFs, which they classified into the following areas: management, procurement, environment, project characteristics, and personnel. The exploration of CSFs creates a foundation for defining the knowledge necessary for implementing a project as well as for defining the control parameters. According to Gasik (2011), the identification of needed knowledge is possible at the project level when a manager passes along a description of the needed knowledge along with the task definition to a team member who is performing an activity. If a similar or the same activity has previously been executed, the project team can acquire the knowledge necessary to perform the activity or solve the problem. The managers of construction projects can gain a better understanding of the needed knowledge by exploring the critical success factors (CSFs) for improving the performance of building projects (Alias et al. 2014).

Among the numerous CSFs explored were factors associated with managerial support, communication, relationships, participant involvement, and decision making (cf. Belassi and Tukel 1996; Chua et al. 1999; Chan et al. 2004; Fortune and White 2006), which may be considered "cultural" factors that relate to the attitudes and behavior of participants in the project delivery process. Indeed, such factors are considered determinants of the organizational culture construct in the management and organizational behavior literature (Hampden-Turner 1994; Robbins and Judge, 2013).

In the above-referenced literature, CSFs relevant to construction project management may be classified into five core clusters: *(1) project management mechanism* (Belout 1998; Chua et al. 1999; Walker and Vines 2000); *(2) project-related factors* (Akinsola et al. 1997; Songer and Molenaar 1997; Belout 1998; Chua et al. 1999; Dissanayaka and Kumaraswamy 1999; Kumaraswamy and Chan 1999); *(3) external environment* (Akinsola et al. 1997; Kaming et al. 1997; Songer and Molenaar 1997; Chua et al. 1999; Walker and Vines 2000); *(4) procurement*

approach (Pocock et al. 1997a, 1997b; Walker 1997; Kumaraswamy and Chan 1999; Walker and Vines 2000; Walker and Rowlinson 2008); *and (5) project culture* (Mullins 1993; Dozzi et al. 1996; Fenn et al. 1997; Chua et al. 1999; Cooper 2000; Phua and Rowlinson 2003).

To ensure that organizational goals are reached, management should pay constant and careful attention to CSF areas (Fortune and White 2006). This implies that to improve construction project performance, it is essential to understand each of these factors and to investigate how they mutually interact and influence performance outcomes. Many studies related to each of these factors have been conducted in this field, and these studies have yielded valuable insights. Among these studies, notable examples include Majid and McCaffer (1998), Proverbs et al. (1999), Xiao and Proverbs (2002), and Moselhi et al. (2005).

Although many academics and practitioners argue that the performance of an organization is dependent on the degree to which the positive and strong values of the culture are widely shared (Ouchi, 1981; Pascale and Athos, 1981; Deal and Kennedy, 1982; Peters and Waterman, 1982; Denison, 1990; Kotter and Heskett, 1992), it is not commonly addressed in the construction project organizations context. Thus, efforts and empirical studies intended to improve project performance have focused less on project organizational culture than on procurement route or project characteristics. In addition, construction project organization is managed by multiple individuals who come from diverse backgrounds, which causes different human interactions. Hence, the behaviors and/or attitudes of the individuals involved in a project are complicated and thus significantly influence project success. The culture factor is believed to generate the differences in participant behavior. Misunderstandings between people and between businesses can result from cultural differences, which in turn can lead to conflict and dissatisfaction among construction project participants (Tijhuis 2011). It is also believed that cultural differences can create conflicts relating to human interactions, which decrease the organizational capacity to achieve project objectives (Ankrah and Langford 2005). It could therefore be argued that culture plays a vital role in the success or failure of project management. Thus, in project management, culture should be considered a significant factor in managing conflicts, enhancing quality outcomes, and promoting innovation.

Taking into account the weaknesses of the procurement system above analyzed, the CSFs could be detected. However, very few studies on CSFs have focused on Vietnam's construction industry, and those that have typically consider this issue from the perspective of "technical sense." Nguyen et al. (2004) conducted a study on success factors in large construction projects in Vietnam by combining knowledge gained from the literature with information regarding current construction practices in Vietnam as perceived by 109 participants in large projects. The study found 20 original success factors that could be categorized into four main groups: comfort,

competence, commitment, and communication. Another study, Ling and Bui (2010), examined factors that lead to successful outcomes of construction projects in Vietnam. The main data in that study were derived from a multiple-interview approach in which researchers investigated three successful projects and three unsuccessful projects. The study identified four fundamental groups of CSFs: the involvement of foreign experts in projects, inspection of the project by government officials, close supervision of new construction techniques, and the accuracy of data on soil, weather, and traffic conditions. However, the role of project organizational culture remains unclear. It is thus essential to empirically investigate the foundation of project organizational culture and its influence on project performance in construction context of Vietnam. The findings of such research will not only provide a valuable contribution to the base of knowledge but also enhance the practices of construction management.

2.4 Summary

This chapter provided a holistic view on construction investment based on statistical reports and the weakness of construction procurement system of Vietnam from the field surveys. The findings show that there has been a massive increase in the investment since 2000s. Along with this increasing investment, the construction industry in has been reported to confront by a number of critical issues related to project performance, which has been plagued by problems including poor quality, cost overruns, time delays, unsafe execution, and client dissatisfaction. In addition, the current poor procurement system is detected that takes place on stages of pre-bid, bid information, bid evaluation, and post award. The factors that related to management mechanism, project characteristics, procurement approach, external environment, and project culture are clarified as influences of project performance. Project organizational culture is recognized as influencing performance; however, efforts and empirical studies intended to improve project performance have focused less on this area. It is thus appropriate to study cultural influence within project context.

Chapter 3 Project organizational culture

This chapter reviews literature on culture issue that is relevant to project organizational culture, which helps to set up the conceptual framework for the research design. Specifically, the literature was conducted in order to develop the theoretical framework for the project organizational culture. It is thus to start with the cultural studies in general; at the organizational level; and the previous studies on the project organizational culture.

3.1 Culture concept

Concept of culture has been investigated in a number of previous researches. There is a list of over 160 various definitions of culture (Bodley 1994; Walker and Rowlinson 2008). Fundamentally, culture is known as a set of learned mores, values, attitudes and meanings that are shared within group members (Duarte & Snyder 1999). In the last two decades, culture has been investigated either in various environments or under various levels; the studies are frequently conducted for national culture, industry culture, and organizational culture.

According to Hostede et al. (2010), symbols refer to words, gestures, pictures, or objects carrying a particular meaning that is recognized as such only by those who share the culture. The words in a language or jargon belong to this category, as do dress, hairstyles, flags, and status symbols. New symbols are easily developed and old ones disappear; symbols from one cultural group are regularly copied by others. This is why symbols have been put into the outer, most superficial layer of Figure 3.1. Heroes are persons, alive or dead, real or imaginary, who possess characteristics that are highly prized in a culture and thus serve as models for behavior. Even Barbie, Batman, or, as a contrast, Snoopy in the United States, Asterix in France, or Ollie B. Bommel (Mr. Bumble) in the Netherlands have served as cultural heroes. In this age of television, outward appearances have become more important in the choice of heroes than they were before. Rituals are collective activities that are technically superfluous to reach desired ends but that, within a culture, are considered socially essential. They are therefore carried out for their own sake. Examples include ways of greeting and paying respect to others, as well as social and religious ceremonies. Business and political meetings organized for seemingly rational reasons often serve mainly ritual purposes, such as reinforcing group cohesion or allowing the leaders to assert themselves. Rituals include discourse, the way language is used in text and talk, in daily interaction, and in communicating beliefs.

In Figure 3.1 symbols, heroes, and rituals have been subsumed under the term practices. As

such they are visible to an outside observer; their cultural meaning, however, is invisible and lies precisely and only in the way these practices are interpreted by the insiders.

The core of culture according to Figure 3.1 is formed by values. Values are broad tendencies to prefer certain states of affairs over others. Values are feelings with an added arrow indicating a plus and a minus side. They deal with pairings such as the following:

- Evil versus good
- Dirty versus clean
- Dangerous versus safe
- Forbidden versus permitted
- Decent versus indecent
- Moral versus immoral
- Ugly versus beautiful
- Unnatural versus natural
- Abnormal versus normal
- Paradoxical versus logical
- Irrational versus rational

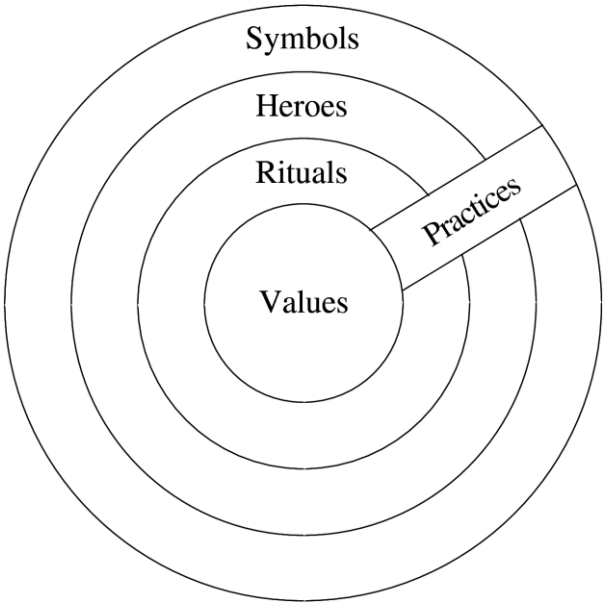
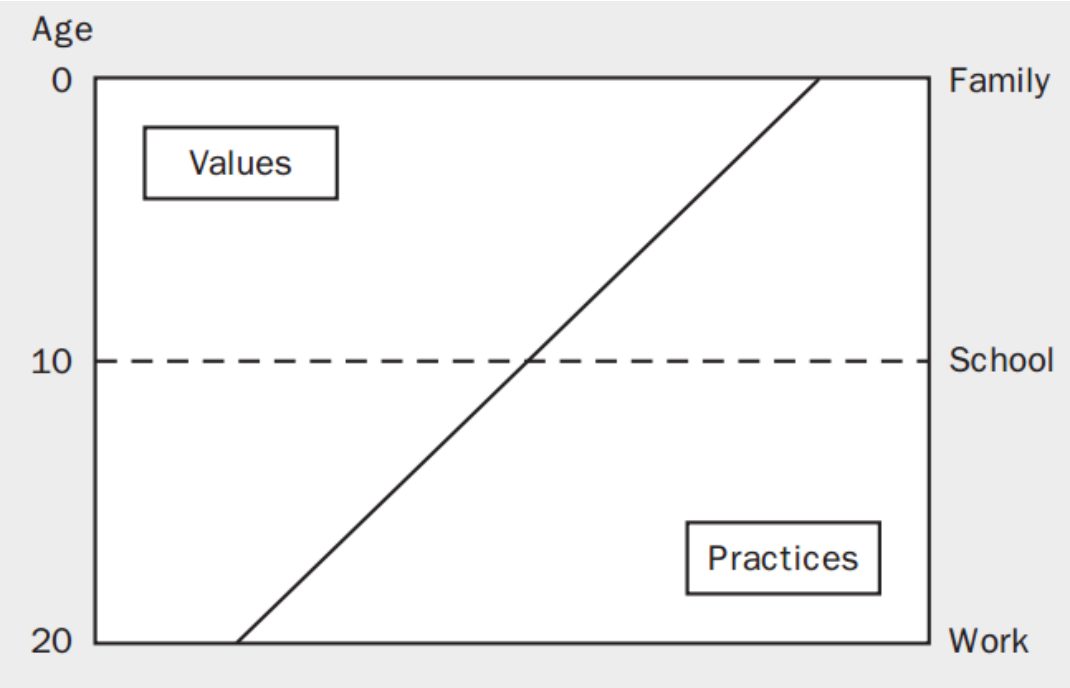


Figure 3.1 The "Onion": Manifestations of Culture at Different Levels of Depth (Source: Hofstede et al. 2010)

Figure 3.2 pictures times and places to which people acquire values and practices. Our values are acquired early in our lives. Compared with most other creatures, humans at birth are very incompletely equipped for survival. Fortunately, our human physiology provides us with a receptive period of some ten to twelve years, a span in which we can quickly and largely unconsciously absorb necessary information from our environment. This includes symbols (such

as language), heroes (such as our parents), and rituals (such as toilet training), and, most important, it includes our basic values. At the end of this period, we gradually switch to a different, conscious way of learning, focusing primarily on new practices.



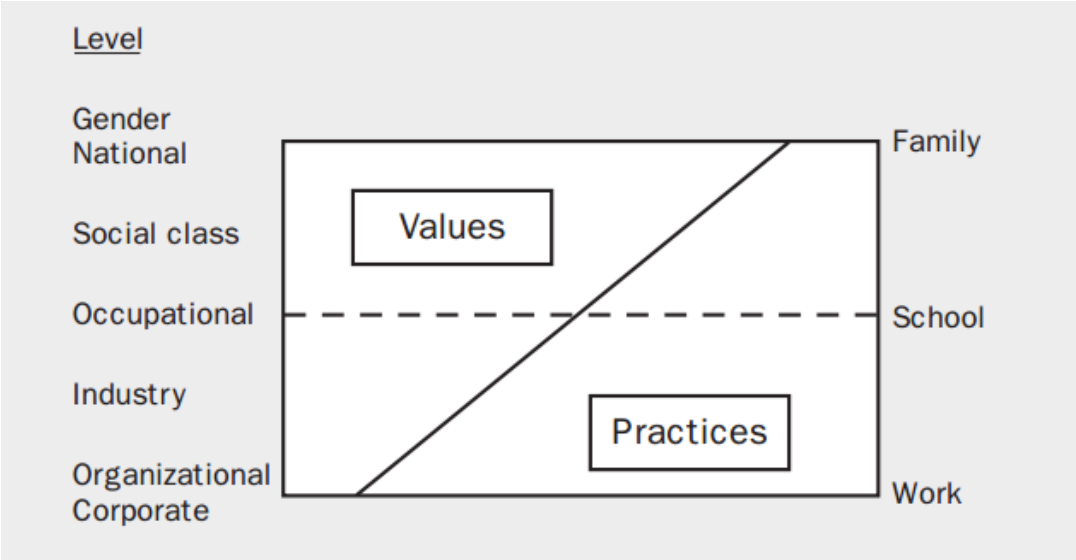


Figure 3.2 The balance of Values and Practices for various level of culture; *Source: Hofstede 2010.*

3.2 Culture in organizations

3.2.1 Concepts of organizational culture

Although organizational culture has been studied widely, there is still no agreement on a

standard definition of the term. The concept of organizational culture originates in cultural anthropology where no consensus on its meanings exists, and is widely perceived within the organizational behavior, management, and marketing literatures (e.g., Gregory, Harris, Armenakis, & Shook, 2009; Homburg & Pflesser, 2000; Schein, 1992). As a result, it is similar with the generic concept of culture; an appropriate definition for organizational culture has been divergently perceived by organizational behavior theorists over the years.

Schneider (2000) defined organizational culture as being almost anything and thus being everything, depending on who is conducting the specific piece of research. It has been presented as the way we do things around here to succeed (Schneider, 2000). Schein (1985) formally defined organizational culture as "a pattern of shared basic assumptions that a group has learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems". Schein (1992) also defined organizational culture that refers to the values and beliefs that provide norms of expected behaviors that employees might follow. It is similarly defined by Eldridge and Crombie (1974) that organizational culture is about the unique configuration of norms, values, beliefs, ways of behaving and so on that characterize the manner in which groups and individuals combine to get things done. Hofstede (1997) and Hofsteed et al. (2010) described organizational culture like the collective mental programming that distinguishes the members of one organization from another. McNamara (1999) also argued that organizational culture included assumptions, values, norms and tangible signs (artifacts) of organization members and their behaviors, which is soon perceived by new members of an organization as the particular culture.

It is also an organization's way of behaving, identity, pattern of dynamic relationships, 'reality', or genetic code, and it has everything to do with implementation of management ideas and how success is actually achieved (Schneider, 2000). It is often based on one or more philosophies related to the various stakeholders (Thompson, 1993), and is learned by new members through a process of socialization. It can also be defined as the set of elements of an organization that determines its way of acting, being, decision-making, communication and others (Serpell and Rodriguez, 2002).

In addition, it is noted that organizational culture is rooted in the basic and universally shared problems (Schein, 1985; Hofstede, 2001), dilemmas (Trompenaars and Hampden-Turner, 1999) or contradictions (Quinn, 1988) which all groups or organizations have to deal with. Efforts made by the group to resolve these problems often yield solutions that are reliable and repeatable, and reflect the groups underlying cultural paradigm (Schein, 1985). Groups of people are faced with the same fundamental problems, but it is the unique solutions they find for these problems

that sets them apart from each other, and is perceived as their culture (Hofstede, 2001).

Commonly, most of the definitions of organizational culture contain elements are about basic assumptions (Schein, 1985; McNamara, 1999), values and norms (Eldridge and Crombie, 1974; McNamara, 1999), beliefs (Eldridge and Crombie, 1974), and mental programs (Hofstede, 1997; Hofstede et al. 2010). These reflect an acceptance of the cognitive or, more generally, the ideational aspects that anthropologists like Geertz (2001) and Goodenough (2003) have offered. Also, organizational culture is defined as artifacts (McNamara, 1999; Khan et al. 2012), ways of behaving (Eldridge and Crombie, 1974; Mullins, 2005), work practices (Khan et al. 2012) and how things are done (Schneider, 2000), which is again in the realm of the sociocultural.

The divergence of those definitions was also indicated by Smircich (1983) that the organizational culture concept has indeed been derived from anthropology. Hence, there is no agreement on culture's meaning in anthropology; it is not surprising that there is also a multiplicity of definitions and applications in the field of organizational studies. However, these multiplicities of organizational culture definitions provide a useful foundation for understanding the source and creation of organizational culture, which is useful in helping to define cultural dimensions for specific contexts (e.g., construction industry).

Gathering those diverse perspectives, a reasonable proposal of organizational culture is as particular pattern of solutions that evolved by organizational members, which is adopted by an organization in dealing with its own problems. The specific solutions chosen by an organization represent "preferred" or "dominant" (Trompenaars and Hampden-Turner, 1999) behaviors and value orientations, and are the manifestation of the organization's culture. In the context of construction industry, for instance, project organizations can individually determine their own particular solutions to resolve the identical problems. This is agreed with Eldridge and Crombie (1994) who refer to the constant exercise of choice as being responsible for the individuality or cultural distinctiveness of organizations. Their study argued that if the daily essential problems which organizations have to confront with can be detected, then 'what is?' questions can be asked to help identify the solutions employed in dealing with these issues. Such solutions will be a reflection of the culture.

3.2.2 Organizational culture model

Many models have been proposed for evaluating organizational culture. There are some following well-known models that have been commonly utilized for years.

3.2.2.1 Typology culture model defined by Harrison and Handy

This model was firstly devised by Harrison (1972) and modified by Handy (1985). The cultures themselves are described in impressionistic and imprecise ways. They have not been rigorously

defined. A culture cannot be precisely defined for it is something that is perceived; something felt (Handy 1985). However, the prevailing culture in the organization can still be identified by questionnaires. Following Harrison's framework about organization ideologies, Handy (1985) concludes that four main types of culture exist in organizations, for example, power, role, task and person. It was emphasized that each type of culture can be good and effective in a specific context; but people are often culturally blinkered, thinking that ways that work well in one place are bound to be successful everywhere. This is not the case.

The description of the different types of organizational culture in this model can be seen in the Table 3.1

Table 3.1Typology model defined by Harrison and Handy, source: Harrison (1972), Handy (1985)

Type of organizational culture	**Description**
Power culture	• As a spider's web, with the all-important spider sitting in the center. Surrounded by ever-widening circles of intimates and influence. • Organizations can respond quickly to events, but they are heavily dependent for their continued success on the abilities of the people at the centre; succession is a critical issue. • Attract people who are power orientated and politically minded, who take risks and do not rate security highly. • Control of resources is the main power base in this culture, with some elements of personal power at the centre. • Size is a problem. They find it difficult to link too many activities and retain control; • Success in creating new organisations with a lot of independence. • Relies heavily on individuals rather than on committees. • Performance is judged on results, to be tolerant of means. • Working requires correctly anticipate what is expected from the power holders and perform accordingly.

Role culture	• be illustrated as a building supported by columns and beams: each column and beam has a specific role in keeping up the building; individuals are role occupants but the role continues even if the individual leaves. • characterized by strong functional or specialized areas coordinated by a narrow band of senior management at the top and a high degree of formalization and standardization; • The work of the functional areas and the interactions between them are controlled by rules and procedures defining the job, the authority that goes with it, the mode of communication and the settlement of disputes. • Position is the main power source in the role culture. • People are selected to perform roles satisfactorily; personal power is frowned upon and expert power is tolerated only in its proper place. • Rules and procedures are the chief methods of influence. • The efficiency of this culture depends on the rationality of the allocation of work and responsibility rather than on individual personalities. • to be successful in a stable environment, where the market is steady, predictable or controllable, or where the product's life cycle is long. • The role culture finds it difficult to adapt to change; • For employees, the role culture offers security and the opportunity to acquire specialist expertise; performance up to a required standard is rewarded on the appropriate pay scale, and possibly by promotion within the functional area. • This culture is frustrating for ambitious people who are power orientated, want control over their work or are more interested in results than method.
Task culture	• Task culture is job-or project-oriented, and its accompanying structure can be best represented as a net. • Some of the strands of the net are thicker or stronger than others,

	and much of the power and influence is located at the interstices of the net, at the knots. • Organisations that adopt matrix or project-based structural designs. • The emphasis is on getting the job done, and the culture seeks to bring together the appropriate resources and the right people at the right level in order to assemble the relevant resources for the completion of a particular project. • Depends on the unifying power of the group to improve efficiency and to help the individual identify with the objectives of the organisation. • Influence is based more on expert power than on position or personal power, and influence is more widely dispersed than in other cultures. • Depends on teamwork to produce results. Groups, project teams or task forces are formed for a specific purpose and can be re-formed, abandoned or continued. • The organisation can respond rapidly since each group ideally contains all the decision-making powers required. • The task culture is therefore appropriate when flexibility and sensitivity to the market or environment are important, where the market is competitive, where the life of a product is short and/or where the speed of reaction is critical. • Control in these organisations can be difficult. Essential control is retained by senior managers • This necessitates the introduction of rules and procedures, the use of position or the control of resources by managers to get the work done. So the task culture has a tendency to change to a role or power culture when resources are limited or when the whole organisation is unsuccessful. • Most managers, certainly at the middle and junior levels, prefer to work in the task culture, with its emphasis on groups, expert power, rewards for results and a merging of individual and group objectives

Person culture	• This type of culture is illustrated by a loose cluster or a constellation of stars. • The individual is the focal point; • Control mechanisms, and even management hierarchies, are impossible in these cultures except by mutual consent. • An individual can leave the organisation, but the organisation seldom has the power to evict an individual. Influence is shared and the power base, if needed, is usually expert; that is, people do what they are good at and are listened to for their expertise. • Consultants – both within organisations and freelance workers – and architects' partnerships often have this person-orientation. So do some universities. A cooperative may strive for the person culture in organisational form, but as it develops it often becomes, at best, a task culture, or often a power or role culture. • It would be rare to find an organisation in which the person culture predominated

3.2.2.2 Deal and Kennedy's (1982) model

Deal and Kennedy (1982) provided a model of organizations based on two dimensions relating to the degree of risk associated with the company's activities, and the speed at which companies – and their employees – get feedback on whether decisions or strategies are successful (figure 3.3).

Figure 3.3 Deal and Kennedy's model of organizational

The description of the dimensions of organizational culture in this model can be seen in the Table 3.2

Table 3.2 Typology model defined by Deal and Kennedy, source Deal and Kennedy (1985)

Culture dimensions	**Descriptions**
The tough guy, macho culture	• Take high risks and get quick feedback on whether their actions were right or wrong. • Feedback comes in the form of financial rewards. • To make decisions quickly and to accept risk. • Employees believe to be as tough as the 'movers and shakers' at the top. • To nurture short-term views.
The work hard/play hard culture	• Fun and action are the rule here, and employees take few risks, all with quick feedback; • This type of culture is characterised by high levels of activity, and each employee has to take few risks. • Instead, success is measured by persistence. • Typically, the primary cultural value is to supply customers with a quality product or service. • These cultures spawn meetings, conventions, team working, office parties, jargon, buzzwords …
The bet-your-company culture	• Cultures with big-stakes decisions, where years pass before employees know whether decisions have paid off. A high-risk, slow-feedback environment. • Found in organisations involved in projects that consume large amounts of resources and take a long time to be realised. • Meetings become very important and experts are drawn in to give their opinions. • Organisation does everything it can to ensure it makes the right decisions initially
The process culture	• A world of little or no feedback where employees find it hard to measure what they do; instead they concentrate on how it's done. We have

	another name for this culture when the processes get out of control – bureaucracy! • Process cultures get a bad press from nearly all quarters. They are the bureaucracies, awash with red tape and memos. • Their low-risk, slow feedback environment means that employees become more concerned with how work is done – the process – than with what the work is. • There is a danger that artificial environments develop, detached from the real world. • Employees in these cultures may be very defensive. They fear and assume that they will be attacked when they have done things incorrectly. To protect themselves they engage in behavior such as circulating emails copied to everyone remotely concerned with the issue.

3.2.2.3 Cameron and Quinn model

The Competing Values Framework of Cameron & Quinn (1999) identify four types of culture in organizations: Clan, Adhocracy, Hierarchy and Market (Figure 3.4)

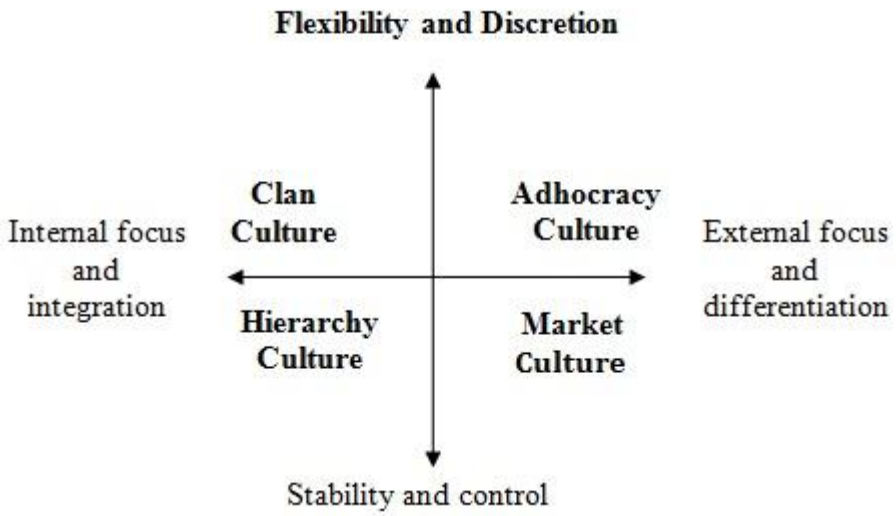


Figure 3.4 the competing values framework, source: Cameron and Quinn (1999)

The description of the four types of organizational culture in this model can be seen in the Table 3.3

Table 3.3 Typology model developed by Cameron and Quinn, adapted from Cameron and Quinn (1999).

Culture dimensions	Descriptions
Clan	Clan oriented cultures are family-like, with a focus on mentoring, nurturing, and "doing things together." A very friendly place to work where people share a lot of themselves. It is like an extended family. The leaders, or heads of the organisation, are considered to be mentors and perhaps even parent figures. The organisation is held together by loyalty or tradition. Commitment is high. The organisation emphasizes the long –term benefits of human resources development and attaches great importance to cohesion and morale. Success is defined in terms of sensitivity to customers and concern for people. The organisation places a premium on teamwork, participation, and consensus.
Adhocracy	Adhocracy oriented cultures are dynamic and entrepreneurial, with a focus on risk-taking, innovation, and "doing things first." A dynamic, entrepreneurial and creative place to work. People stick their necks out and take risks. The leaders are considered innovators and risk takers. The glue that holds the organisation together is commitment to experimentation and innovation. The emphasis is on being on the leading edge. The organisation's long term emphasis is on growth and requiring new resources. Success means gaining unique and new products or services. Being a product or service leader is important. The organisation encourages individual initiative and freedom.
Market	Market oriented cultures are results oriented, with a focus on competition, achievement, and "getting the job done." A results-orientated organisation whose major concerns is with getting the job done. People are competitive and goal orientated. The leaders are hard drivers, producers, and competitors. They are tough and demanding. The glue that holds the organisation together is an emphasis on winning. Reputation and success are common concerns. The long-term focus is on competitive actions and achievement of measurable goals and targets. Success is defined in terms of market share and penetration. Competitive pricing and market leadership are important. The organisational style is hard driving competitiveness.
Hierarchy	Hierarchy oriented cultures are structured and controlled, with a focus on efficiency, stability and "doing things right." A very formalised and structured place to work. Procedures govern what people do. The leaders pride themselves on being good coordinators and organisers who are efficiency minded. Maintaining a smooth running organisation is most critical. Formal rules and policies hold the organisation together. The long-term concern is on stability and performance with efficient, smooth operations.

	Success is defined in terms of dependable delivery, smooth scheduling, and low cost. The management of employees is concerned with secure employment and predictability.

3.2.2.4 Hofstede model

Hofstede et al. (1990) defined an organizational culture model including six-dimensions, which is defined as perceived common practices (i.e., symbols, heroes, and rituals) that carry a specific meaning within the organizational unit.

The description of the six dimensions of organizational culture in this model can be seen in the Table 3.4

Table 3.4 The practice dimensions of Hofstede's organisational culture model, Source: The Hofstede Centre

Cultural dimensions	Description
Means-oriented vs. Goal-oriented	• In a means oriented culture: work has to be carried out; people identify with the "how". • In a goal-oriented culture: to achieve specific internal goals or results, even if these involve substantial risks; people identify with the "what". • In a **very** means-oriented culture: people perceive themselves as avoiding risks and making only a limited effort in their jobs. • In a **very** goal-oriented culture: to achieve specific internal goals or results, even if these involve substantial risks.
Internally driven vs. Externally driven	• In a **very** internally driven culture: employees perceive their task towards the outside world as totally given.. • In a **very** externally driven culture the only emphasis is on meeting the customer's requirements; results are most important and a pragmatic rather than an ethical attitude prevails.
Easygoing work discipline vs. Strict work discipline	• refers to the amount of internal structuring, control and discipline. • A **very** easygoing culture reveals loose internal structure, a lack of predictability, and little control and discipline; there is a lot of improvisation and surprises. • A **very** strict work discipline reveals the reverse. People are very

	cost-conscious, punctual and serious.
Local vs. Professional	• In a local company, employees identify with the boss and/or the unit in which one works. • In a professional organisation the identity of an employee is determined by his profession and/or the content of the job. • In a **very** local culture, employees are very short-term directed, they are internally focused and there is strong social control to be like everybody else. • In a **very** professional culture it is the reverse.
Open system vs. Closed system	• This dimension relates to the accessibility of an organisation. • In a **very** open culture newcomers are made immediately welcome. • In a **very** closed organisation it is the reverse.
Employee-oriented vs. Work-oriented	• In **very** employee-oriented organisations, members of staff feel that personal problems are taken into account and that the organisation takes responsibility for the welfare of its employees. • In **very** work-oriented organisations, there is heavy pressure to perform the task.

3.2.2.5 Denison's dimensional model

Denison & Mishra (1995) analyzed data collected from 764 organizations and identified four different cultural traits that reflect diverse dimensions of an organization's effectiveness. The survey and model has been translated into 14 languages and used with organizations in over 30 countries, while the applications indicate that the model is valid with national characters (Denison, Haaland & Goelzer 2004). Several studies conducted against different cultural backgrounds have validated this as an appropriate instrument to use in non-western countries (Fey & Denison 2003).

Four cultural traits sets adaptability, mission, involvement and consistency constitute the organizational model that has been developed by Denison. This is displayed in the Figure 3.5.

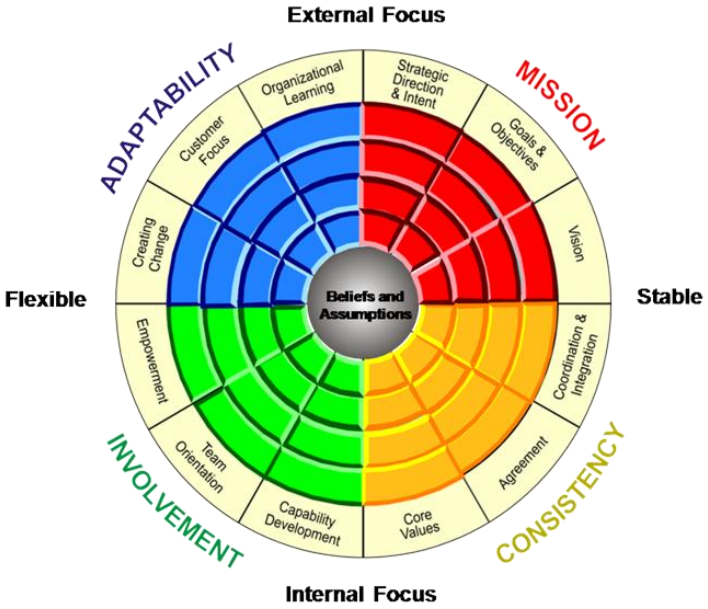


Figure 3.5 Denison's organisational culture model, Source: Denison 2000

The descriptions of the traits that constitute the model are listed in Table 3.5.

Table 3.5 Description of traits in Denison's model, Source: Denison 2000

Traits		Descriptions
Adaptability	Creating change	The organization is able to create adaptive ways to meet changing needs. It is able to read the business environment, react quickly to current trends, and anticipate future changes.
	Customer Focus	The organization understands and reacts to its customers and anticipates its future needs. It reflects the degree to which the organization is driven by a concern to satisfy its customers.
	Organizational Learning	The organization receives, translates, and interprets signals from the environment into opportunities for encouraging innovation, gaining knowledge, and developing capabilities.
Mission	Strategic Direction & Intent	Clear strategic intentions convey the organization's purpose and make it clear how everyone can contribute to the Intent business.
	Goals & Objectives	A clear set of goals and objectives can be linked to the mission, vision, and strategy, and provide everyone with a clear direction in their work.
	Vision	The organization has a shared view of a desired future state. It embodies core values and captures the hearts and minds of the organization's people, while providing guidance and

		direction.
Consistency	Core Values	Members of the organization share a set of values that creates a sense of identity and a clear set of expectations
	Agreement	Members of the organization are able to reach agreement on critical issues. This includes both the underlying level of agreement and the ability to reconcile differences when they occur.
	Coordination and Integration	Different functions and units of the organization are able to work together well to achieve common goals. Organizational boundaries do not interfere with getting work done.
Involvement	Empowerment	Individuals have the authority, initiative, and ability to manage their own work. This creates a sense of ownership and responsibility toward the organization.
	Team Orientation	Value is placed on working cooperatively toward common goals for which all employees feel mutually accountable. The organization relies on team effort to get work done.
	Capability Development	The organization continually invests in the development of the employee's skills in order to stay competitive and meet on-going business needs.

3.2.3 Composition of culture

As demonstrated in the discussions so far, culture manifestations are either largely invisible or very visible to individuals. The intangible aspects comprise values, beliefs and underlying assumptions (Schein, 1985; Bass, 1990; Hofstede, 2001); while the tangible aspects encompass artifacts, creations and behavior norms (Schein, 1985) or symbols, heroes and rituals (Hofstede, 2001), which are referred to as ‘practices’ in Hofstede et al. (2010). Hofstede et al. (2010) described those cultural aspects as layers of culture with an onion diagram (Figure 3.1) to which the core represented by the values and underlying basic assumptions, and the outer skins denoted by rituals, heroes and symbols of the organization. A similar model is provided by Schein (1985), together with a modification of this model provided by Hatch (1993) is provided in Figure 3.6 for comparison.

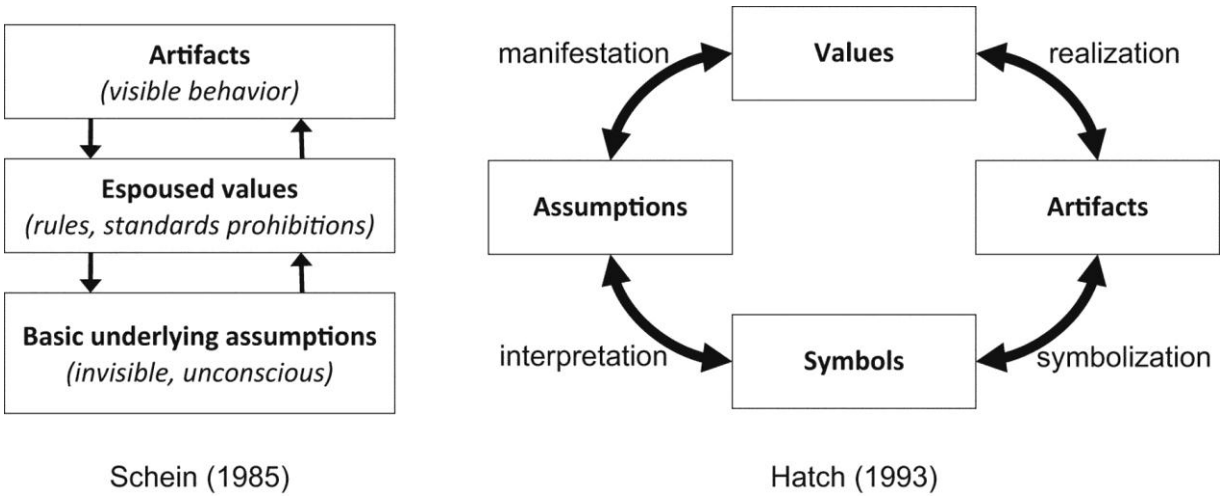


Figure 3.6 Schein and Hatch's models of culture

Taken together, values and practices are considered as two sides of culture. According to Hofstede et al. (2010), values were defined as the individual's personal preferences in work and life-related issues, while practices are defined as descriptive perceptions by the employee of aspects of the work environment or actual work situation. As such, these descriptions make culture becomes more readily readable.

Generally, an investigation of organizational cultures involves examining the practices, as well as the values and underlying assumptions that inform these practices (Trompenaars and Hampden-Turner, 1994). However, emphasis on values and practices vary from study to study, with implications for the research questions asked. For instance, whereas an emphasis on practices will lead to the pursuit of 'what is?' questions, an emphasis on values will lead to 'why?' and 'what ought to be?' questions (Hofstede, 1997).

For years, several studies have analyzed based on values and basic assumptions. Although values and basic assumptions are critical aspects of organizational culture, it has been argued that organizations differ more in work practices than in values (Hofstede et al., 1990; Hofstede, 1997; Hofstede et al. 2010; Khan et al. 2012). van den Berg and Wilderom (2004) argued that organizational culture can be better defined by organizational practices, and as a result can be derived from existing practices within an organization, department, or work unit. This perspective was also supported by the agreement that the conventional view of culture, which concentrated on notions of shared values and beliefs, was inadequate; instead, organizational culture should be considered from strongly operational perspective "as embodied in the organization's structures, mechanisms and practices." (Smith 2000). These operational aspects characterize culture in action and are more credible reflections of the organization's culture than statements of values and beliefs which may be out of step with culture as implemented (Smith, 2000). Taken together, these arguments reinforce the notion that consistent and widespread

practices are reflections of organizational culture Christensen and Gordon (1999). It is beneficial to approach culture from the perspective of organizational practices because practices are more readily observable and measurable and can thus be compared across organizations and can be directly related to individual and organizational performance (Christensen and Gordon, 1999). This approach is also consistent with Fellows and Liu (2002) and Wilson (1999) who argued that behavior provides the active and dynamic expressions of culture and therefore provides data through which culture may be studied.

The implication of organizational culture composition above-mentioned provide a guidance that can be employed in defining the project organizational culture in construction context, which is argued that the emphasis should be on practices rather than so much on values or basic assumptions. This argument is agreed with the definition of organizational culture stated previously, which is perceived as being embedded in the solutions employed by construction project organizations in dealing with fundamental problems. As such, 'What is?' questions are appropriate in this research context to identify and draw out the practices or solutions that construction project organizations have evolved for dealing with their problems. The values and underlying assumptions that govern these practices or solutions can subsequently be inferred from these.

3.3 Project organizational culture in construction industry context

3.3.1 The project organization

Field and Keller (1998) provided a definition of project as: "A discrete undertaking with defined objectives often including time, cost and quality (performance) goals". The Project Management Institute (2004) defines a project as "a temporary endeavor undertaken to create a unique product, service, or result". As such, the project can be undertaken in one or several organization(s) to attain the specific objectives within certain constraints. Furthermore, the PMI (2004) defines project management as "the application of knowledge, skills, tools, and techniques to project activities to meet project requirements", accomplished through various processes, for example, initiating, executing, controlling and closing.

In construction context, the "project" is defined as "the total activity to produce the construction products, from inception to commissioning and occupation, involving an agreed and planned objective and total input of specialist participants and their interrelationships" (Kwakye 1997).

Therefore, construction project organization can be stated as an organization that members (i.e., client, supervision, contractors) gather with their own designated responsibilities under

specific structures to produce construction products.

3.3.2 Literature reviews on the study of project organizational culture

Under the project perspective, cultural concept was discussed in a few studies with its impact on business operations. In general, project culture is defined as the general attitude towards projects within the business (Widmen, 2004). As Korzilius (1988) & Mullins (1993) concluded that to form a unified, robust project culture is very crucial for successful projects; without such formations, the achievement of the overall project objectives could be difficult. Also the quality of interrelationships between project participants, studied by Soetanto et al. (1999), is eventually as a determinant of overall project performance and individual participant performance. Although these interrelationships were not investigated within the cultural context, culture must be appropriately viewed as a significant aspect. It also has an impact on the propensity for litigation (Fenn et al., 1997; Phua and Rowlinson, 2003), and the attitudes and behaviors towards such aspects as health and safety (Cooper, 2000). According to Gareis and Huemann (2000), along with the scope of work, the project schedule, the project costs, the project organization, and the project context, project culture is as an objective of the project management process. In addition, the project manager who are able to form project culture encouraging teamwork and personal motivation, as well as being capable to quickly detect and resolve problems that threaten project works (Gray and Larson, 2000).

Likewise, other the number of literatures admitted the significance of project culture (Kwan and Ofori, 2001; Walker, 2002) although these are rarely supported by empirical research. Most empirical studies on project culture are of a quantitative nature. Gray (2001) conducted a study to examine the relationship between project outcomes and the social and management climate in which those projects are implemented. Based on extensive field research involving project management professionals in major British organizations, there is evidence to suggest that project success declines when the level of personal and environmental threat perceived by project staff increases. Other organizational characteristics, such as free expression, questioning, participation in the definition of goals, innovation and intrinsic satisfaction from the work itself, are all recognized to be positively associated with project success indicators; while organizational change and conflict are reported to negatively relate to project success. Anderson (2003) employs the organizational culture model and instrument which was developed by Harrison (1972) and advanced by Handy (1985) to measure culture at both project and organizational levels. The outcome of a project was found to have a weak association with task-oriented culture, which is commonly described as the appropriate project culture. It was demonstrated that a strong task-oriented culture may improve the budget performance of a

project, while other performance factors of a project such as schedule, participants' satisfaction and functionality of the final product are not directly influenced.

Particularly, in construction industry practice, which is structured by project-based industry (Fellows et al., 2002), culture issues at project level need to have more insight. Construction project organizational culture is however similarly less studied area (Dainty et al. 2007). Abeysekera (2002) described culture within construction to be about the "characteristics of the industry, approaches to construction, competence of craftsmen and people who work in the industry, and the goals, values and strategies of the organizations they work in". In essence, culture within construction is about what is carried out, how and when it is done, who is involved and why certain things are done the way they are. These perceptions of culture as applied to construction are consistent with the earlier generic definitions of culture posited by the likes of Bodley (1994).

The culture of the construction industry is blamed for many of the industry ills, in particular the adversarial and antagonistic aspects. Although culture has persistently plagued the industry and affected performance (Latham, 1994 and Egan, 1998), it is however less studied area in construction management. Among those few attempts in investigating the impacts of project culture, Kumaraswamy et al. (2001) suggested a framework to explain and analyze the foundations of project culture in construction projects. In this framework, a typical project culture is derived from a set of four overlapping sub-cultures: i.e. organizational subcultures, operational sub-cultures, professional sub-cultures, and individualistic sub-cultures. Thomas et al. (2002) employed the standard 'Competing Values Framework' model as well as the instrument developed by Cameron and Quinn (1999) to assess the project culture of thirteen Australian construction projects. The revelations diagnosed that clan type cultures were positively correlated with quality outcomes; whereas, market cultures and more common on construction projects were found to be negatively correlated. Subsequently, the project culture in construction was suggested that it should be shifted from the current common market culture to a clan culture (Thomas et al, 2002). They argued that a project culture should be designed to align organizational goals and objectives with those of the individual participants. This design helps to reduce conflicts, to enhance communication and coordination, and to increase the ease with which project objectives are achieved. More recently, Zuo et al. (2008) adapt existing organizational dimensions to propose five dimensions for a project culture model: integrative, cooperative, goal-oriented, flexible, and people-oriented. Their model focuses on relationships in contract procurement in the Chinese construction industry, and the findings indicate that there are medium to large positive correlations between all five dimensions of project culture and all indicators of project performance, namely, satisfaction with project success, commercial success,

future business opportunities, and satisfaction with relationships with other parties. The majority of these correlations are positive; the exceptions are goal orientation and flexibility, which present negative correlations with most of the project performance indicators. The results reveal that project culture contributes to improved project performance.

3.3.3 Limitations of previous studies on project organizational culture

Among few attempts in determining construction project culture framework, these studies are pretty much divergent and have their own limitations. For example, the model developed by Kumaraswamy et al. (2001, 2002 cited Zuo and Zillante, 2005) is very complicate to understand due to its incorporated several components at various levels of culture. Zuo and Zillante (2008) proposed a model for construction project culture, which the cultural orientations dedicated to relationship contracts such as partnering and alliancing projects; while the traditional procurement is still dominated. Ankarh et al. (2008) proposed a framework consisting with organizational culture, which was essentially relevant to the drivers for change of UK construction industry reported by Egan (1998). More recently, Cheung et al. (2011) employed a set of literature of organizational culture artifacts to investigate the construction industry of Hong Kong. Although these few studies have demonstrated on construction project perspective with some specific context, several knowledge gaps emerge in the above-discussed literature.

Although it is increasingly clear that cultural factors play a significant role in the construction industry, little attention has been paid to relevant cultural traits in terms of a work-practice based approach in which shared knowledge can be measured from the practice of the industry (Kostova 1999). Instead, studies have adopted existing organizational culture frameworks. Moreover, although research on the phenomenon of culture and its effects on performance in particular could inform cultural change, such research has thus far been disparate and inadequate. The nature of the implied relationships between project organizational culture and performance remain blurred, and therefore, the cultures that are best suited to the peculiar nature and needs of the construction industry have not been identified yet. Moreover, Phua and Rowlinson (2004) note a lack of rigorous empirical support for the supposed positive relationship between culture and project success. Consequently, it has been difficult to advocate and shape cultural orientations that are associated with improved performance or, conversely, to take steps to mitigate the effects of cultural orientations that are associated with poor performance. In addition, the theory of organizational behavior, which examines what people do in an organization and how their behavior affects the organization's performance (Robbins and Judge 2013), has not yet been addressed at the project level. Nevertheless, the questions of what project organizational culture is and the nature of the relationship between culture and performance at the project level

clearly remain unanswered in the context of the construction industry and deserve further investigation. Based on the above, there appears to be a need to empirically develop a framework of project organizational culture, which is used for predicting how project performance would be, particularly in the case of Vietnam construction industry. This study therefore aims to fill this gap.

3.4 Implications for current research design

It is evident for existence and operation of the phenomenon of culture at the organizational level from the literature, implying that an investigation into this phenomenon within the context of a construction project organization is a viable line of enquiry. It is also demonstrated that there is sound basis for hypothesizing the influence of culture on performance outcomes.

It also illustrates the composition of culture which is split between practices and values/underlying assumptions. The notion of culture based practices is agreed with the "culture as variable" perspective, while culture based values/underlying assumptions more closely aligned with the "root metaphor" perspective (Smircich 1983). According to Smircich (ibid) organizational researchers who agree with the view of "culture as variable" tend to be more concerned with prediction, generalizability, causality, and control. These are key issues with which this research is concerned especially as the aim is to examine cultures across construction projects and explore their relationships with outcomes. A "culture as variable" perspective (ibid) is thus appropriate in this research. It can be argued that this mode of enquiry should be a precursor to any enquiry into the more fundamental issues of meaning and the processes by which organizational life is possible which is the concern of those researchers aligned with the "root metaphor" perspective (Smircich, 1983). In other words, before starting to look for underlying assumptions or meanings and trying to draw cognitive maps it is important to know firstly what the culture is, as manifested in practices.

As a result, it is reasonable for the research to focus on 'what is?' questions, to draw out responses on existing practices, as opposed to 'what ought to be?' or 'why?' questions which lead to responses on preferences and values. In asking these 'what is?' questions, the research will examine those solutions adopted in addressing problems as manifested in organizational structures, information and control systems, organizational processes, behaviors, myths, legends, stories, and charters, among other aspects (Taylor and Bowers, 1972; Schein, 1985; Thompson, 1993).

As reinforced the abovementioned, Usoro and Kuofie (2006) specified that organizational culture dimensions can broadly be classified into value-based and work-practice based. The

value-based approach has been diggings for years. Hibbard (1998) and White (1998), for instance, focused on values to dimension organizational culture. Martin and Terblanche (2003) define organizational culture in terms of values as the deeply seated values and beliefs shared by personnel in an organization. Although many organizational culture dimensions have been analyzed based on a valued-based approach, this approach has been criticized because organizations differ more in work practices than in values (Khan et al. 2012). It has been pointed out that organizations differ more in work practices than on values (Wilderom et al. 2004). Moreover, it has been argued that values can be measured from work practices because significant aspects of values are often apparent from organizational practices (Wilderom et al. 2004; Hofstede et al. 2010).

Like societies, organizations are unique and their individuality may be expressed in terms of their cultures, much like the uniqueness of individuals is often expressed in their personalities (Eldridge and Crombie, 1974; Allaire and Firsirotu, 1984; McNamara, 1999). According to Deal and Kennedy (1982), culture exists in every organization, even if this culture is fragmented and difficult to read. Kostova (1999) defines organizational culture as "particular ways of conducting organizational functions that evolved over time.... [These] practices reflect the shared knowledge and competence of the organization". Following Kostova's (1999) approach, Wilderom et al. (2004) define organizational culture as a shared perception of organizational work practices within organizational units that may differ from others. The current research adopts work practice based approach in defining organizational culture. The organizational culture definition in the following is based on Kostova (1999) and Wilderom et al. (2004) definitions: The set of particular organizational functions that are carried out by organizational members in a specific way that makes it different from other organizations or from other units within an organization .

It is thus appropriate to argue that culture existing is also true for construction project organizations. It has been argued in Ankrah et al. (2005) that organizational behavior within construction context is not random which, extrapolating from Hofstede (1984), presupposes that there are cultures within construction project organizations that regulate behavior. An implicit reference to this culture is made in Cherns and Bryant (1984) who posited that the relationships between the parties within the construction project organization is supplemented and moderated by informal understandings and practices which have evolved to cope with the difficulties that characterize construction projects. Evidence of such culture is also more explicitly reported in Thomas et al. (2002) who examined "project culture" and its impact on quality outcomes, and in Dainty et al. (2002) who examined its impact on women on construction sites – referring to a "site culture." Regardless of the label used in the construction domain, organizational culture is

the concept of relevance and it is important to understand how it operates.

Taken together, the current study adopts a work practice-based approach to define project organizational culture in the following manner, based on the definitions offered by Kostova (1999) and Wilderom et al. (2004): the set of behaviors or attitudes observed in perceptions of practices shared by project participants in particular ways that help explain or resolve the problems encountered during the course of a project. This is captured in the figure 3.7.

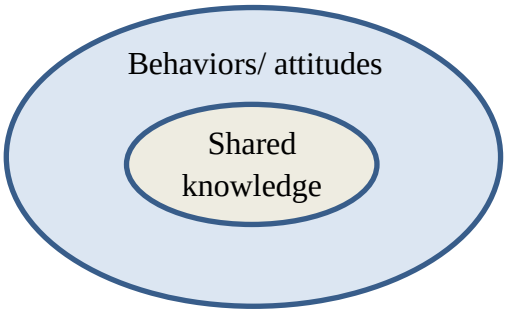


Figure 3.7 Conception of POC from perspective of work-practice based

3.5 Summary

This chapter provided a holistic view on either culture in general or organization perspective. The researches in project organizational culture and their limitations were reviewed. The findings show that studies on POC have less empirical focus; instead of this, most of previous claims were subjective. It is thus appropriate to empirically investigate POC, which helps to provide a comprehensive understanding of culture impacts in project management. As such, a concept of POC was necessary to propose as the foundation for the next investigations.

Chapter 4 Culture and performance - develop a theoretical model for research design

The preceding chapter shows explicitly the evidence of hypothesis that culture does have an impact on performance, and this influence can be captured empirically. In order to investigate systematically this empirical relationship between culture and performance, it is necessary to have a conceptual model that presents logically manner all the essential aspects to be investigated, and provides appropriate parameters and points of reference for investigating culture within a construction project context. This chapter focuses on the development of such a conceptual framework and on the development of empirical referents to aid the development of appropriate hypotheses, data collection and hypotheses testing.

This chapter presents a model for the causal relationship between project organizational culture and project outcome based on the system theory, organizational behavior theory, and underpinned by culture theories in chapter 3. This model is a result of integrating the concepts of the Input-Output model and the procurement process of construction projects. A systems approach is adopted to underpin the model by presenting a holistic view of the input-transformation-output process.

4.1 Organizational behavior

An organization is defined as a system to which people and other resources are coordinated in order to achieve performance goals (Miner 1988, Robbins 1983). The diversity of perspectives associated with the many definitions of organization once led Porter et al. (1975) to say "Organizations must mean all things to all people". It is thus the behavior of these people that constitutes the behavior of the organization (i.e., organizational behavior). Therefore, it has been argued that there is no such study as behavior of organization (Naylor et al. 1980), it is but a study of behavior of individuals in organizations and this can be seen from the various definitions of organizational behavior which emphasize the individuals.

"The study of human behavior, attitudes, and performance within an organizational setting; drawing on theory, methods, and principles from such disciplines as psychology, sociology, and cultural anthropology to learn about individual perceptions, values, learning capacities, and actions while working in groups and within the total organization; analyzing the external

environment's effects on the organization and its human resources, missions, objectives and strategies ..." (Gibson et al. 1982).

“ ..the study of the behavior, attitudes, and performance of workers in an organizational setting; the organizations and groups effects on the worker’s perceptions, feelings, and actions; the environment's effect on the organization and its human resources and goals, and the effect of the workers on the organization and its effectiveness" (Szilagyi and Wallace 1983).

"The studies of what people do in and in relation to organizations; the field that explores the factors within an organization that influence individual behavior and how individual behavior in turn affects the organization" (Miner 1988).

The field of organizational behavior has been developed in the late of 1940, which is rooted in the behavioral sciences, particularly psychology and sociology. Historically, it has been more focused on empirical than theoretical issues and has been a base for criticism. For example, the work of Skinner (1953) on behaviorism which involves the four principles (1) observable behaviors are of primary interest, (2) response frequency is the key form of behavioral measurement, (3) clear specification and measurement of the desired behaviors must be made, (4) clear contingencies must be established between the job behavior and rewards or reinforcement, is criticized as inadequate to drive scientific research and facilitates understanding (Lee et al. 1989, Locke 1977) and the surge of cognitively based theory and research in psychology has demonstrated that cognitive constructs are necessary in any theory of human action (Bandura 1986). Organizational behavior is, therefore, branded as applied organizational technology (Lee et al. 1989, Komaki 1986) and is criticized for being conceptually indefensible and primarily involves the relabeling, in behaviorist terms, of cognitive constructs and already well-established motivational techniques. A trend then developed to emphasize the importance of conceptual formulations of behavior in organizations which leads to the development of various theories of employee motivation, leadership behavior and effectiveness, organizational change and development.

In addition, models are useful technique in order to visually understand social systems (Hofstede, 2001). Also, models are considered as simplified designs for visualizing objects, processes, systems or concepts too complex to grasp (Fellows and Liu, 1997). A model is an abstraction of reality, a simplified representation of some real world phenomenon (Robbins and Judge 2013). An example of such a model is organization behavior (OB) which is provided in Robbins and Judge (2013) (Figure 4.1). Specifically, organizational behavior (often abbreviated OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within organizations, for the purpose of applying such knowledge toward improving an organization’s effectiveness. The model proposes three types of variables (inputs, processes, and

outcomes) at three levels of analysis (individual, group, and organizational). The model proceeds from left to right, with inputs leading to processes and processes leading to outcomes. Notice that the model also shows that outcomes can influence inputs in the future.

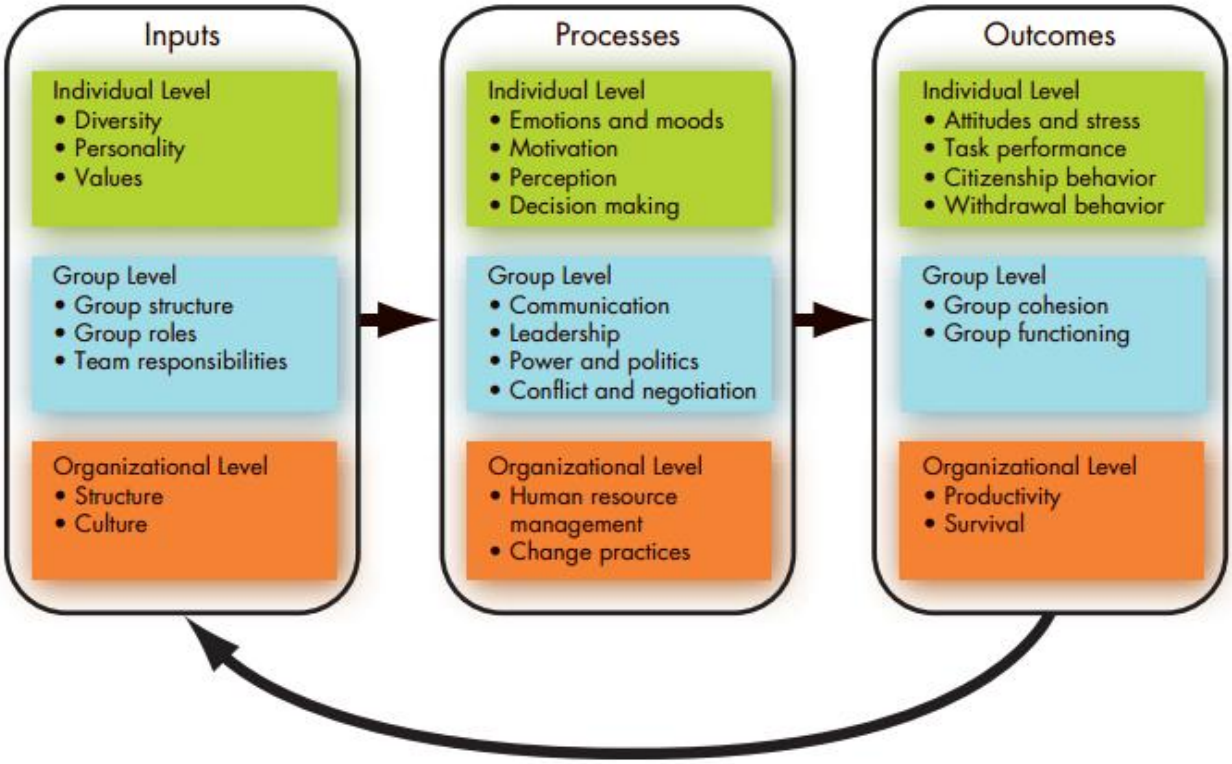


Figure 4.1 A basic OB model (source: Robbins and Judge, 2013)

To sum up the definition, OB is the study of what people do in an organization and how their behavior affects the organization's performance (Robbins and Judge 2013).

4.2 Proposed project organizational behavior model for research design

4.2.1 Uniqueness of project organization

It is often claimed that a project organization has its own characteristics which are different in nature from the other types of organization (i.e., conventional organization). There are some common features that are shared by almost all the projects. The four most notable features are that the project organization (1) is temporarily formed for the duration of the project delivery, (2) the product is usually one-off, (3) has a high level of skill diversity and (4) organizational members are gathered from diverse entities

The temporary nature of project means that every project has a definite beginning and end; temporary does not necessarily mean the duration of the project is short. It refers to the project's engagement and its longevity (PMI 2013). At the same time, most projects are undertaken by a team created specially for the project. The project team manages the project from inception to completion under the leadership of a project manager (Uher & Loosemore 2004). The team is disbanded when the project is complete, which means the project team seldom outlives the project.

The uniqueness nature of project means that every project creates a unique product, service, or result with a different location, different design, different circumstances and situations, different stakeholders, and so on (PMI 2013).

The project environment is dynamic, complex and diverse (Sidwell 1990). These are characterized with various stages and various participants involved in a course of project. In general, each project is separated into several project phases that help to improve the efficiency (PMI 2004; Meredith & Mantel 2006). The collection of these phases is the well-known project life cycle. Generally, the project life cycle defines: 1) what technical work to do in each phase; 2) when the deliverables are to be generated in each phase and how each deliverable is reviewed, verified and validated; 3) who is involved in each phase; and 4) how to control and approve each phase (PMI 2004). The project phases are marked by the completion of one or more deliverables. Representative project life cycles of construction projects include: feasibility, planning and design, construction, and occupation (PMI 2004).

Diverse entities means that there are several project stakeholders who involve in the course of project. Project stakeholders are individuals and organizations that are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or project completion (PMI 2004). PMBOK (2004) also note that stakeholders often have very different objectives that may come into conflict. As a result, managing stakeholder expectations may be difficult, and needs cooperative relationships and trust between the stakeholders.

Besides the common features that exist in general projects, almost all construction projects share a number of specific characteristics that are different from the projects in other industries. The construction projects are of relatively long duration, constructed outside and geographically dispersed (Walker 2002).

Compared with the projects in other industries, construction projects are carried out by a relatively large number of businesses (i.e., clients, contractors, and supervisions) and the number

of the organizations involved in the course of project is increasing (Murray et al. 1999). The influential decision-makers are representatives of the organizations (Liu and Fellows 1999). The organizations are only loosely integrated (Kwakye 1997). The different cultures exist within different organizations as well as different professionals (Liu & Fellows, 1999). The organizations involved in each project are independent companies with their own goals and objectives (Walker 2002). This creates a potential for conflict between the needs of each firm and of each project and may induce adversarial relations.

This “temporary, unique, and diverse" nature of project organization, which arises from the fact that it is formed only for the duration of the procurement of the project, is different from other types of organization which are on a more permanent basis. Whether temporary or permanent, unique or collective, an organization exists to achieve goals for the sake of its need to survive and the project organization (albeit being temporary) is goal oriented. The goal oriented in terms of the project team's responsibility to execute the project and to achieve the goals of the project (i.e., the expectations of clients). As such, the performance of the project is always being evaluated based on whether the goal of the project is obtained. Therefore, theoretically, it is subject to the same general framework for the study of behavior in any organization. However, to appropriately examine those temporary nature characteristics, it is necessary to propose a conceptual model for studying of project organization behavior within construction industry that is adapted from the theory of organization behavior. This model is a result of integrating the concepts of the OB and the procurement characteristics within construction context to which a project is derived from the behavior and performance of the project organization. A systems approach is also adopted to underpin the model by presenting a holistic view of the input-transformation-outcome process.

4.2.2 Develop a conceptual model

As discussed, the study of organizational behavior focuses on the individual and the interaction of individuals in the organization. It is also noted that people should be managed to achieve project objectives (Walker 2002). People play a vital role in achieving successful project outcomes in the context of project management (Uher & Loosemore 2004). Also, project organizations are acted as an organization, which is a conglomerate of two or more people (i.e., project’s stakeholders). As such, it is reasonable in conducting the research of project organizational behavior by adapting the knowledge of organizational behavior. It is thus a conception of project organization behavior (POB) is proposed as the study of what participants who are client, contractor, and consultant do in a project organization and how their behavior affects the project performance (Figure 4.2)

Figure 4.2 A conceptual model of project organizational behavior (POB)

"Input"

Inputs are the variables like personality, group structure, and organizational culture that lead to processes. These variables set the stage for what will occur in an organization later. Many are determined in advance of the employment relationship. For example, individual diversity characteristics, personality, and values are shaped by a combination of an individual's genetic inheritance and childhood environment. Group structure, roles, and team responsibilities are typically assigned immediately before or after a group is formed. Finally, organizational structure and culture are usually the result of years of development and change as the organization adapts to its environment and builds up customs and norms.

However, taking into account the context of construction industry, it has been argued that the project organization needs to be examined against the background that they are in the nature of the 'temporary organization'/'short life organisations' (SLOs). As such, they act differently from conventional organizations. Drawing from theory on SLOs (cf. Meudell and Gadd, 1994; Mullins, 2005) together with literature from the project management, the behaviors of a construction project organization are determined with key factors such as project goals and objectives, project characteristics, diversity in location and stakeholders, procurement approach.

"Transformation"

If inputs are like the nouns in project organizational behavior, transformations are like verbs. Transformations are behaviors and actions that participants engage in as a result of inputs and that lead to certain outcomes/project performance. Theatrically, these behaviors are captured in individuals, group, and organizational level, relating to emotions and moods, motivation, perception, and decision making, communication, leadership, power and politics, and conflict and negotiation, human resource management and change practices (Robbins 2013). Taking into specifically consideration, those behaviors covering factors associated to management support,

communication, relationships, involvement of participants and decision making (Belassi and Tukel 1996; Chua et al. 1999; Chan et al. 2004; Fortune and White 2006) are what may be considered as "cultural" factors relating to attitudes and behaviors of participants who involve the project delivery process. Similarly in the management and organizational behavior literature, such factors are determinant of the organizational culture construct (Hampden-Turner 1994; Ankrah and Langford 2005; Robbins 2013).

In terms of the manner of cultural impacts into construction project performance, it is noted by literature that project organizational culture influences attributes such as the propensity for litigation, the degree of participation and openness, approaches to decision-making, the quality of communications and working relationships, recruitment and human resource policies, management philosophies and practices adopted on construction projects, strategy, and approaches to construction (Fenn et al., 1997; Cooper, 2000; Riley and Clare-Brown, 2001; Low and Shi, 2001; Phua and Rowlinson, 2003; Skitmore et al., 2004). The above mentioned of attributes or 'behaviors' is by no means exhaustive and it is necessary to broaden and categorize these factors to provide a comprehensive framework for investigating the influence of organizational culture on construction project performance. These attributes of organizational culture have been severally referred to as indices of culture (Taylor and Bowers 1972), aspects of culture (Thompson, 1993), traits of culture (Liu 1999), indicators of culture (Handy, 1995), as well as elements of culture (Rameezdeen and Gunarathna, 2003). More commonly, as seen in the preceding chapter, these attributes are referred to as dimensions of culture (Schein, 1985; Trompenaars and Hampden-Turner, 1999; Hofstede, 2001).

As above discussed, few attempts related to investigating the impacts of project organizational culture have been conducted. Among these studies, notable examples include Kumaraswamy et al. 2001; Thomas et al. 2002; and Zuo et al. 2008. However, the research into the phenomenon of culture and particularly its effects on performance which can/should inform such cultural change has so far been disparate and inadequate. The nature of the implied relationships between project organizational culture and performance still remain blurred and as a result, it has not been possible to identify 'best practice' cultures most suited to the peculiar nature and needs of construction. Phua and Rowlinson (2004) also recognized this fact that the lack of rigorous and empirical support for the supposed positive relationship between culture and project success. It has been consequently challenging either to advocate and shape those cultural orientations associated with improved performance or to take steps to mitigate the effects of those orientations associated with poor performance. Based on the above, there appears to be a

need to empirically verify the influence of participants' behavior on performance within construction project organizations.

"Outcome"

Outcomes are the key variables that you want to explain or predict, and that are affected by some other variables. What are the primary outcomes in OB? Scholars have emphasized individual-level outcomes like attitudes and satisfaction, task performance, citizenship behavior, and withdrawal behavior. At the group level, cohesion and functioning are the dependent variables. Finally, at the organizational level we look at overall profitability and survival. As such, the consequences of the culture within POB perspective are specifically examined in terms of the project outcomes (i.e., project performance).

4.3 Development of research hypothesis

This conceptual framework (i.e., POB) offers an approach for the specific investigations of the research design. Data are focally collected on the appropriate attentions, which possibly measures the project organizational culture dimensions and enables to assess the extent to which those particular cultural dimensions influence on project outcomes. Hypothesis is thus significantly supportive in further investigations of this research. As such, the fundamental hypothesis can be drawn from the conceptual framework and the previous discussions that facilitate the examination of the data for relationships.

It has been verified by the literature review (refer Chapter 3) that there is sufficient theoretical base and relevant evidence to argue that construction project performance outcomes are attributable in part to the culture within the construction project organization. Having considered the research scope, the hypothesis can thus be proposed as follow:

H1: Project organizational culture affects construction project performance

Although such an association between culture and performance within organizational level has been introduced to in a number of inquiries as recognized through the literature review (refer Chapter 3), this assertion within POB perspective has not been assisted as empirical evidence yet. Given that the research aim as defined in Chapter 1 was to seek into empirical evidence of a relationship between culture and performance within project level, the hypothesis proposed is an appropriate approach for validating the research claim in the view of the data collected to achieve the aim of the research.

To test the validity of the proposed hypothesis above, the subsequent data collection, analyses and discussion will be conducted. For this to be done requires the development of empirical referents for measuring project organizational culture and measuring the performance of construction projects. These are considered in the following subsections.

4.4 Measuring organizational culture

Similar to the definition of project organizational culture adopted for this research, Schein (2004) argued that culture only arises when individual assumptions lead to shared experiences that solve the group's problems. The learning experiences of group members as their organization evolves are thus the source that spring cultures (Schein 2004). In order to identify each project's organizational culture, it was therefore necessary to examine the sources of those dimensions. Cultural dimensions are rooted in fundamental problems that a group of people must address or for which they must find solutions (Schein 1985; Hofstede 2001). Thus, when looking for the dimensions of construction project organizational culture, one could argue that a useful source of information is the fundamental problems experienced by project participants during project delivery. For example, these types of construction industry problems in the UK are well documented in major construction industry reports that have been published since the Simon (1944) report and the subsequent Egan (1998) report. These reports examine construction industry problems and largely recount the same industry failures time and time again. However, such reports are not globally available for the construction industry. As such, from the perspective of work-practice based as discussed in previous chapters, this study thus explored such industry difficulties and then developed cultural artifacts by consulting with experts in the construction industry. This technique of determining cultural artifacts is considered to be a reasonable approach in the field of project management (Cheung et al. 201; Cserháti and Szabó 2014).

4.5 Measuring performance

The term "performance" encompasses all aspects of a construction scheme, including the following seven elements (Gardenas and Ashley 1992): (1) effectiveness; (2) efficiency; (3) quality; (4) productivity; (5) quality of work life; (6) profitability; and (7) innovation. These elements are defined as follows. *Effectiveness* is a measure of 'doing the right things', such as meeting deadlines, adhering to quality and quantity requirements and ensuring client satisfaction. *Efficiency* is a measure of 'doing things right' in terms of resource consumption and is calculated as the ratio of estimated resource consumption to actual resource consumption. Efficiency can also be described as the productivity of resources. *Quality* measures the conformance of a

completed project to the owner's specifications and the fitness of the project for its intended use. *Productivity* is defined as the ratio between output (i.e., the physical or real volume of goods and services produced, such as the constructed facility) and input (i.e., the physical or real quantities of materials used, such as labor, materials, equipment, management, energy and capital). *Quality of work life* assesses the effect on employees of working and living within in-house systems that emphasize and ensure satisfactory working conditions and the safety and security of employees, among other factors. *Innovation* measures the creative process involved in adapting products, services, processes, or structures in response to internal and external pressures, demands, requirements, and changes. *Profitability* evaluates the use of financial resources by considering the ratio of revenues to costs, return on assets, return on equity, and return on investment.

At present in the construction industry, systematic methods of performance measurement have influenced many construction firms, government sectors, public and private clients and other project stakeholders. Performance measurement refers to the regular collection and reporting of information about the inputs, efficiency and effectiveness of construction projects. Two models developed to measure construction project performance are the Integrated Performance Index (Pillai et al. 2002) and Key Performance Indicators (Egan 1998). The Integrated Performance Index was developed by Pillai et al. (2002) to measure the performance of R&D projects, while Key Performance Indicators (KPIs) are the UK construction industry's response to Egan's report (Egan 1998) and measure project performance based on 10 identified parameters. These parameters consist of seven project performance indicators (construction cost, construction time, cost predictability (design and construction), time predictability (design and construction), defects, client satisfaction with the product and client satisfaction with the service) and three company performance indicators (safety, profitability and productivity). The use of such indicators to evaluate organizational performance is very common (Cheung et al. 2012). Many industries employ industry-specific KPI systems to measure process performance that is critical to the success of an organization. Notwithstanding their popularity, KPIs seem to be more appropriate for assessing performance at the project level (Kagioglou et al. 2001).

Among the performance measures that indicate the success of a project, cost, time and quality are generally considered to be the most vital performance indicators for construction projects (Xiao and Proverbs 2002; Baloi and Price 2003; Cserháti and Szabó 2014; Davis 2014; Mir and Pinnington 2014). Several researchers have suggested that safety should be added to the list of construction project performance indicators (Cox et al. 2003; Lim and Mohamed 1999; Sawacha et al. 1999; Cserháti and Szabó 2014). These performance indicators are used to measure project performance, and the most important indicators are viewed as the KPIs of construction projects.

Because a project's outcome, or performance, is multifaceted (Carvalho et al. 2015; Carvalho and Rabechini 2015; Todorović et al. 2015), this research considered project outcome from the perspective of practitioners based on the literature. Participants in this study were first presented with a complete list of the available performance indicators found in the literature and were asked to propose performance indicators that reflect industry practice. This method of determining performance indicators is considered a reasonable approach to assess the performance quality and success of a project (Westerveld 2003; Diallo and Thuillier 2004). The performance measurement indexes adopted in this study are described in Table 4.1.

Table 4.1 Proposed performance indicators

Performance indicators employed	**References**
Client satisfaction with quality	Alias et al. (2014); Belout (1998); Baloi and Price (2003); Davis (2014); Williams et al. (2015); Xiao and Proverbs (2002)
Client satisfaction with timeliness	Alias et al. (2014); Belout (1998); Baloi and Price (2003); Cserháti and Szabó (2014); Garbharran et al. (2012); Liu et al. (2006); Xiao and Proverbs (2002)
Client satisfaction with cost	Alias et al. (2014); Baloi and Price (2003) ; Cserháti and Szabó (2014); Garbharran et al. (2012); Xiao and Proverbs (2002)
Client satisfaction with safety and environmental issues	Atkinson (1999); Alias et al. (2014); Cox et al. (2003); Cserháti and Szabó (2014); Lim and Mohamed (1999); Sawacha et al. (1999)
Satisfaction with profitability	Bassioni et al. (2005); Chan and Chan (2004); Carvalho et al. (2015); Mir and Pinnington (2014); Xiong et al. (2014)
Labor productivity	Gardenas and Ashley (1992); Liu et al. (2006); Xiong et al. (2014)
Lessons learned	Kululanga et al. (2001); Liu et al. (2006); Luu et al. (2008); Todorović et al. (2015)
Overall performance	Lam et al. 2007.

4.6 Summary

This chapter develops a conceptual model of project organizational behavior based upon the knowledge of organizational behavior and characteristics of construction procurement. This

model provides theoretically the relationships between culture orientations and performance of construction projects, which supports to drawn and test the research hypotheses.

This chapter also provides the measures of cultural artifacts within construction project organization by examining to the fundamental problems in construction industry as identified in chapter 3, the particular solutions. Project performance measurements are proposed by consulting participants' experience based on the literature, providing the performance indicators that reflect industry practice.

Chapter 5 Research methodology

This chapter presents the research methodology adopted for undertaking this study. Arguments are presented justifying the choice of qualitative and quantitative approach. The data collection and data analysis are explained.

5.1 The research paradigm

The research paradigm is nominated as the first step for subsequent choices regarding methodology, methods, literature or research design in order to systematically investigate the relationships among constructs described in the theoretical framework. Mac Naughton et al. (2001) define paradigm as including the following three elements: a belief about the nature of knowledge, a methodology and criteria for validity. There are two major paradigms: the interpretivist paradigm (constructivist paradigm) in which researchers most likely rely on qualitative data collection methods and analysis; and the positivist paradigm that is most commonly aligned with quantitative methods of data collection and analysis (Mackenzie and Knipe 2006).

In the literature the terms qualitative and quantitative are often used in two distinct discourses, one relating to what is more commonly understood to be the research paradigm which refers to distinctions about the nature of knowledge, i.e., how one understands the world and the ultimate purpose of the research and the second referring to research method, i.e. how data are collected and analyzed, and the types of generalizations and representations derived from the data (McMillan and Schumacher 2006). Alternatively, O'Leary (2004) provides the definition of these terms as adjectives for types of data and their corresponding modes of analysis, i.e. qualitative data that is represented through words, pictures, or icons analyzed using thematic exploration; and quantitative data that is represented through numbers and analyzed using statistics. This definition suggests that the terms qualitative and quantitative refer to which the data are collected, analyzed, and reported instead of the theoretical approach to the research.

More recently, research approaches have become more complex in design and more flexible in their application of methods with mixed-methods being more acceptable and common. A mixed-methods approach to research is one that resides in the middle of qualitative and quantitative approaches, which incorporates both numeric information (e.g., on instruments) as well as text information (e.g., on interviews) so that the final database represents both quantitative and qualitative information (Creswell 2009). According to Gorard (2004), the combined or mixed-methods research has been recognized as a "key element in the improvement

of social science, including education research" with research strengthened by the use of a variety of methods. It is also argued that mixed method research "requires a greater level of skill", "can lead to less waste of potentially useful information", "creates researchers with an increased ability to make appropriate criticisms of all types of research" and often has greater impact, because figures can be very persuasive to policy-makers whereas stories are more easily remembered and repeated by them for illustrative purposes (Gorard 2004). Many researchers believe that qualitative and quantitative methods are as complementary choosing the most appropriate method/s for the investigation (Creswell 2009, Thomas 2003, and Krathwohl 1993). While it appears that qualitative or quantitative approaches are individually favored by a researcher, in effect no one paradigm actually prescribes or prohibits the use of either methodological approach. However, this seems uncomfortably to be applied with researchers who are robustly consistent with a particular approach. Almost inevitably in individual paradigm of both qualitative and quantitative approaches, there are weaknesses in application. It is thus to be fully effective to a research, mixed-methods approach is necessarily applied. Paradigms, which overtly recommend mixed methods approaches allow than simply determining the data collection and analysis methods, collecting both quantitative and qualitative data and integrating the data at different stages of inquiry; it is also expected to use of both approaches in tandem so that the overall strength of a research is greater than either qualitative or quantitative methods (Creswell 2009).

It is also noted in the literature review (refer Chapter 3) that research into culture in a construction context has typically been either qualitative or quantitative. These both approaches have its own weaknesses in the field of human behavior research. Walker (1997) notes the advantages of undertaking a quantitative approach can yield results that identify which factors significantly predict the independent variables in the study. At the same time, he also acknowledges the disadvantage that to rely entirely upon this approach is difficult to answer the 'how?' and "why?" type questions. As such, a qualitative approach is required for those either interpretative or deductive discussions. Also, Hofstede et al. (1990) and van den Berg and Wilderom (2004) argued that a combining approach between qualitative and quantitative methods is the most applicable methodology for this kind of research. This methodology is agreed with Denison and Mishra’s (1995) in studying the relationship between organizational culture and effectiveness, and is also in line with the arguments of Raftery et al.(1997), Kumaraswamy et al.(1997) and Liu (2002) who favored applying synthesizing paradigms that is believed to be appropriate in the field of construction management.

Creswell (2009) described a scenario in which the mixed methods design in which a researcher wants to both generalize the findings to a population as well as develop a detailed view of the meaning of a phenomenon or concept for individuals. As this adaptation, the researcher first explores generally to learn about what variables to study (i.e., in a qualitative manner, for example, observation or open-ended interview), and then follow up with studying those variables with a large sample of individuals (i.e., in a quantitative manner, for example, wide questionnaire with closed-ended structures). This strategy proposes an appropriate approach for this research, which aims to empirically investigate the relationships between project organizational culture and performance outcomes (i.e., understanding the best predictors of outcomes). It is thus an essential adaptation of positivist orientation (quantitative approaches) is the best choice (Creswell 2009), which is incorporated with constructivist paradigm (qualitative approaches).

To adopt Creswell's (2009) proposal, the strategies for this research start with in-depth interviews with participants (qualitative) to understand and establish the meaning of the phenomenon of the industry, and to capture a sense of what project organizational culture is perceived to be from a construction practitioner's perspective. A survey of a large number of individuals is then followed up by conducting a questionnaire (quantitative) which is developed based on the information obtained from the first qualitative results. An overall outline of this approach is shown in Figure 5.1.

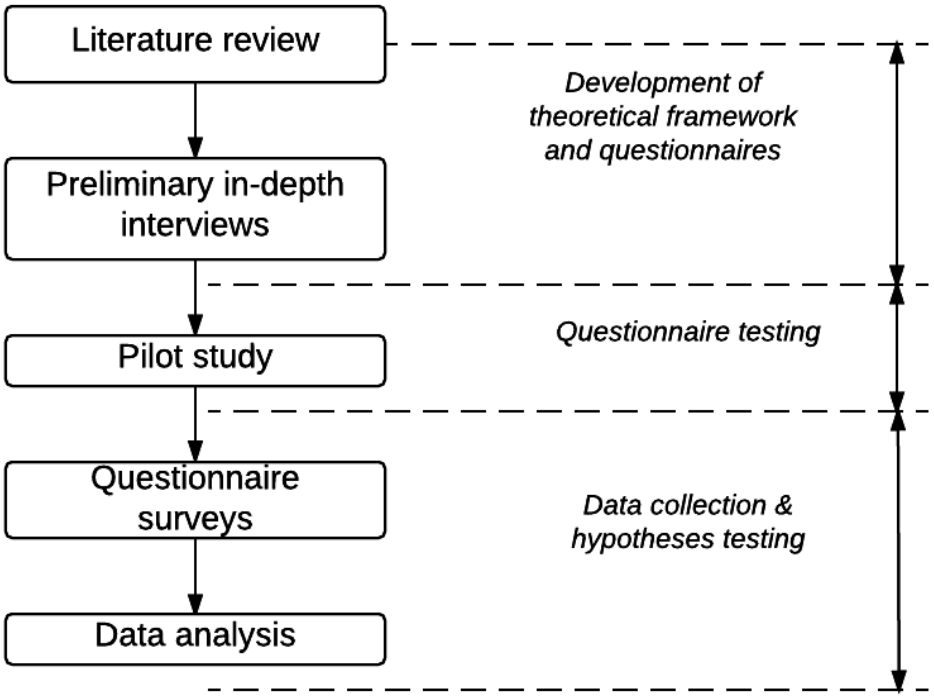


Figure 5.1 Research methodology design

5.2 Research design

Based on the research paradigm adopted and the main research objectives, this study first qualitatively involves with reviewing the relevant literature on critical factors (CFs) influencing project performance, organizational culture, project culture, project performance and organizational behavior, gathering preliminary information through interviews. Project organizational culture, project performance and the project characteristics are defined as variables that are tested in this study. A questionnaire survey is then conducted those variables as quantitative to a large sample of practitioners in construction industry. The specific objectives and the data collection methods in each research phase are described in Table 5.1

Table 5.1 Research phase

No.	Main Objectives	Data collection methods	Strategies/ approaches	Expected Outcomes
1	To review literature on understanding of the critical factors (CFs) influencing project performance and the role of culture;	Literature review	Qualitative	Summarized framework of CFs
2	To clarify what is project organizational culture (POC) in the construction context based on literature of universal culture and organizational culture knowledge;	Literature review and interviews	Qualitative	Definition of POC in construction context
3	To develop a conceptual framework that represents the relationship between project organizational culture and project performance;	Literature review	Qualitative	Theoretical framework shaping the research hypotheses
4	To construct a project organizational culture framework, which is used for predicting the project performance;	Questionnaire survey	Quantitative	POC framework
5	To examine empirically the potential relationships between each specific cultural dimensions and the project performance; and	Questionnaire survey	Quantitative	Statistical relationship between variables
6	To develop a model that describes the relationships between POC and project performance and helps to identify the best practices of cultural orientations.	Questionnaire survey	Quantitative	The model representing the relationships between POC and project performance

5.3 Data collection methods

5.3.1 Triangulation

As abovementioned, there are numerously available data collection methods. It is also noted that each of these data collection methods have their own intrinsic biases in collecting technique. The methods of collecting data will naturally affect the analyses that can be undertaken, and hence the results, conclusions, values and validity of the study (Fellows & Liu 2002). Exclusive reliance on one method may bias or distort the picture of the particular slice of reality being investigated (Burns 2000). Therefore, applying multiple methods in collecting data from multiple sources offers rigor to research (Sekaran 2003). This triangulation process will help to hat facilitate validation of data that are being collected through different methods, in particular, it refers to the application and combination of several research methods in the study of the same phenomenon. As such, the triangulation can be very powerful to increase the credibility and validity of the results, and to assist in making inferences and in drawing conclusions (Figure 5.2).

Interview, questionnaire, and observation are the three essential data-collection methods in social research. Although interview offers flexibility in terms of adapting, adopting and changing the questions as appropriate during the interviews, questionnaires provides a more productive of collecting data in terms of the researcher's time, energy and costs. Unobtrusive methods of data collection such as extracting data from company records have the advantage of ensuring the accuracy of the information obtained (Sekaran 1992). The choice of data-collection methods depends on the facilities available from the organization, the extent of accuracy required, the expertise of the researcher, the time span of the study and other costs and resources associated with and available for data gathering.

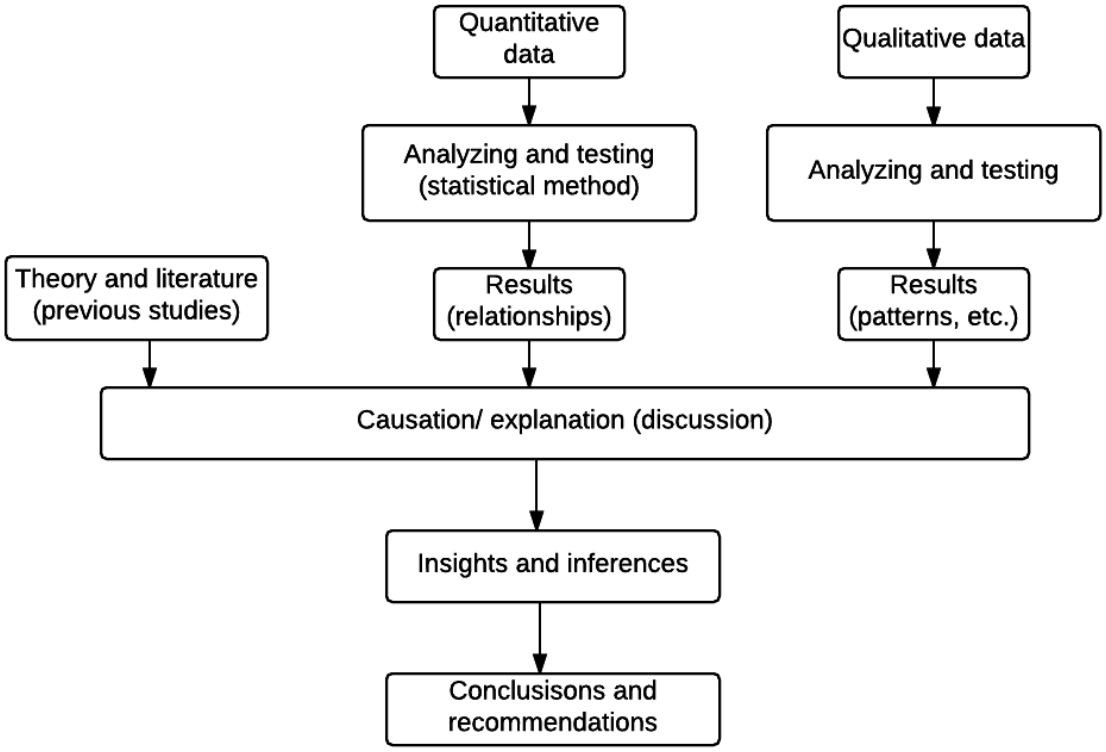


Figure 5.2 Triangulation of data collection method (source: Fellow and Liu 2002)

5.3.2 Literature review

The literature review is employed to identify knowledge gaps of the research emphasis, to define the research problem, research questions, and research scope, and to design the research framework. It is noted that the literature review is studied relevantly materials which includes textbooks, journal articles, conference papers, refereed publications, research reports, dissertation abstracts, and internet information (Chan et al. 2004; Creswell 2009). Based on the literature review of this study, a conceptual framework that represents the relationships between variables (i.e., project characteristics, project organizational culture, and project performance) was hypothetically created. The theoretical evidences for constructing this model are based on reviewing current available organizational culture models (e.g., Denison's model, Harrison and Handy's model, Hofstede et al's model and Cameron's model); critical factors (CFs) influencing project performance, and organizational behavior. The aim of this research phase is to determine:

- understanding of the critical factors (CFs) influencing project performance and the role of culture;

- the importance of the cultural factors affecting the performance of construction projects;
- what is project organizational culture (POC) in the construction context ;
- A conceptual framework that represents the relationship between project organizational culture and project performance.

Based on the literature review, the research hypotheses are established in which independent variables and dependent variables are defined. The research instruments (e.g., the questionnaire, and the interview schedule) are also developed.

5.3.3 Interview and questionnaire development

Empirical evidence is required to support the conceptual model about research themes based on theoretical evidence. Therefore, the interview is commonly adopted, which offers an opportunity to ignore a priori ideas and to draw on the knowledge of practitioners without imposing biases or knowledge obtained directly from literature or experience (cf. Nicolini, 2002). Like Hofstede et al. (1990), the intention was to paint a qualitative, empathetic description of the culture on construction projects.

A series of in-depth semi-structured interviews were carried out with experienced practitioners working within the industry. The main thrust of the interviews was to draw out those issues that were the main problems faced by project organizations during the course of project. It was also to draw out the concept of project organizational culture and to determine the key performance indicators which can be practically measured as relevant. The interview schedule used to guide the interviews is shown in Appendix B. It is important to emphasize that this schedule only served as a guide, and the interviewer was free to probe and ask questions in any order as appropriate. In line with Trompenaars and Hampden-Turner (1999), the investigations were always started with the question “what does the concept of culture mean to you?”

Twenty-one interviews were conducted in all with highly experienced construction industry practitioners who represented for both clients (10 participants) and contractors (11 participants) in the primary role of project manager or senior engineer. The participants had an average of 20 years working experience who were working in of the North and the South of Vietnam

This qualitative phase was intended to help in refining the definition and measurement of project organizational culture, which is necessary to design appropriately the main questionnaire. A clear definition makes project organizational culture more clearly understood by the respondents to the official questionnaires, enabling more accurate information in the research process.

The outcome of this process is a framework of project organizational culture and a questionnaire schedule that was developed from the theoretical model of project organizational culture and tested and modified following the preliminary interviews and the pilot with industry professionals.

5.3.4 Pilot studies

A pilot study conducted with a small sample provides an opportunity to evaluate the clarity and comprehensiveness of the questionnaire, which help further in improving the survey instrument. Feedback from the respondents can identify the gaps that need to be filled, the time required for, and ease of, completing the exercise (Fellows & Liu 1997). In addition, discussing the instruments with the supervisor and other researchers is encouraged as a useful supplement to the piloting, which provides a research oriented view of the questions, the manner of structuring questionnaire, and possible approaches to the analysis of responses. Walker (1997) also noted that a pilot study is a useful tool in providing a focus mechanism to more clearly establish the research direction: "After undertaking the pilot study, the research question boundaries become clear and the research becomes more focused".

A pilot study involving 35 respondents (20 in North and 15 in the South of Vietnam) was undertaken. It also tested whether the questions were intelligible, easy to answer, unambiguous, and so forth. This pilot study tested the validity of the questionnaires that were developed after the literature review and preliminary interview. Necessary modifications were made to make sure the questionnaire expressed the intended meaning of the researcher and collected the required data.

5.3.5 Questionnaire survey

A questionnaire is an efficient data-collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest (Sekaran 1992). Questionnaires are widely applied in collecting data since the data can be obtained fairly easily, and the questionnaire responses are simply coded. When well-validated instruments

are used, the findings of the study benefit the scientific community through replicated results and additions to the theory base (Sekaran 1992).

The questionnaire is designed to collect the participants' view on the actual situation of project organizational culture via the course of construction projects and the performance of these projects. Items included in the questionnaire are designed to be unambiguous and easy for the respondent to answer. The questionnaire only contains questions designed to obtain necessary data.

Questions assessing project performance in the survey are based on respondents' relative perceptions rather than specific absolute measures. These KPIs are derived from the literature review. It is believed that the objective measures (KPIs) can provide strong support to the subjective perceptions of respondents.

The earliest version of the questionnaire was tested by discussing it with supervisors, academic staff and professionals in the construction industry. This was followed by the pilot study. The questionnaire was first prepared in English and then translated into Vietnamese, which necessitated certain changes to the survey due to the classical and modern forms of the Vietnamese language. In particular, it was difficult to translate project management phrases from English to Vietnamese (e.g., “performance” and “project organizational culture”). Moreover, any changes to the survey had to be correctly translated before its official distribution to respondents. The questions were then modified to generate the most precise answers. The English version of the questionnaire is provided as Appendix C.

The cover page of the questionnaire has a brief introduction to the research to the respondents in order to help them to understand what they are expected to do during the survey. The substantive part of the questionnaire is divided into three sections. In the first section, respondents were asked to provide their demographic characteristics and a description of project survey features. The remaining sections aimed to collect the data required for the variables in the research model, including cultural artifacts and project performance indicators. The survey required each respondent to assess his or her experience in a recently completed construction project using a five-point Likert scale that ranged from one (strongly disagree/not at all satisfied) to five (strongly agree/extremely satisfied).

Case-specific data were collected from construction practitioners in Vietnam who play the role of project manager for clients and contractors. Having considered that the targeted

cultural artifacts are developed through continuous collaboration among key members (i.e., clients, supervisors, and contractors), clients and contractors with positions of project leaders, managing directors, and senior engineers were approached after consultation for a pilot study to determine that they had sufficient information to complete the required questionnaire items. A total of 416 questionnaires were distributed to participants between April 2015 and June 2015. The distribution was conducted through e-mail and face-to-face interviews. Follow-up telephone calls were made to remind and urge the participants to respond to the survey. Participants were required to respond to survey questions based on the most recently completed project in which they were involved. A total of 265 responses were received, and 199 samples qualified for analysis, which represents an effective rate of 47.8%, exceeding the expected range of 25-40 percent for surveys of this type (Furtrell, 1994). Other sources that support this view include Takim et al. (2004) which reported response rate norms for postal questionnaire surveys to be 20 – 30%. Among the 199 valid samples, 84.9% were from contractors and 15.1% were from clients. Regarding respondents' background, 79.5% of the respondents were project managers and 20.5% were project engineers (i.e., with responsibilities as project managers). Furthermore, 79% of the respondents had more than five years of experience in project management. Regarding the types of projects, 55.5% of the projects were infrastructure systems (roads, bridges, and water systems), 39.5% of the projects were buildings (apartments, commercial, and offices), and 5% of the projects were industrial and factory facilities.

5.4 Data analysis methods

After being collected, the data were analyzed in order to find out the relationship between variables. As it is noted above, quantitative data were collected in the questionnaire survey; and qualitative data were collected in the in-depth interviews. Different approaches were adopted to analyze these different types of data.

5.4.1 Quantitative data

The statistical analysis of results can be used to provide empirical support for some generally accepted ideas on the matter.

The results of the questionnaire survey were analyzed to explore the participants' view on the project organizational culture and the performance of construction projects. Nonparametric statistical techniques were used to analyze the research findings. The R

software - Project for Statistical Computing- was used as the main software to carry out the statistical calculations.

A descriptive analysis was undertaken to gain an initial feeling of the data. The descriptive statistics describe a body of data (Leedy & Ormrod 2005). Checking the central tendency and the dispersion" will show how the respondents have reacted to items in the questionnaire and how good the items and measures are (Sekaran 2003). Descriptive analysis is used to investigate the validity of particular measures and to detect possible errors when inputting into the program. These will be illustrated in the descriptive analysis section of Chapter 6 and Chapter 7.

The second step is to test the value of data by computing the Cronbach's alpha of the measured concept. Factor analysis was also conducted to reveal the validity of the instrument, for example, criterion-related validity and construct validity. A principal component factor analysis (PCFA) was undertaken to test the factor structure of the culture artifacts. The PCFA is an effective tool for demonstrating convergent and discriminant validity and to reduce the number of variables to be considered in subsequent analyses (Hair et al. 1998). Furthermore, the reliability of the data was verified for the factorized artifacts using Cronbach's alpha (Sharma 1996). The alpha value ranges from 0 to 1; the higher the alpha value, the more reliable the groupings of artifacts. A Cronbach's alpha value that is higher than 0.7 is regarded as 'good' and /or 'acceptable' in reliability testing (Sharma 1996; Pallant 2005).

Several statistical techniques have been used to analyze data in order to find out the relationship among variables. These techniques include Spearman rho correlation analysis, Kruskal-Wallis test of each variable with each other variable in the data set, and multiple regression.

The Spearman rho correlation coefficient is a measure of the linear association between the ranks of two variables (Norusis 2005). Coefficient results range from -1 to +1. The positive number of the coefficient means there that there is positive association between two variables while the negative number of the coefficient means there are negative association between two variables. A correlation coefficient of .10 indicates a weak association, .30 for a medium association and .50 for a strong association.

Kruskal-Wallis test is used to determine whether or not the variability between the means of the ranks for the groups was due to the randomisation of ranks between groups (Davis

2005). In this research, the Kruskal-Wallis test was used to examine: whether or not there are significant differences between the culture of projects that are procured via different projects.

The Post hoc test is used when testing for differences between two independent groups when the assumptions for the parametric t test cannot be met (Burns 2000). In this research, the Post hoc test was conducted when the Kruskal-Wallis test showed that there were significant differences in the project organizational culture across projects.

Multiple regression analyses were performed to test whether the cultural factors predicted project outcomes. The stepwise method is frequently used to decide which independent variables should be used in a regression model and how such variables should be incorporated into the model. Although the main value of stepwise selection is that it can be used to select a subset of explanatory variables based on statistical criteria, several recent studies have emphasized the limitations of stepwise selection, including the lack of stability of the set of selected variables and the bias in parameter estimates (Prost et al. 2008). This method also subsequently ignores both the variables that are not selected and the uncertainty caused by the variable selection procedure (Viallefont et al. 2001; Wang et al. 2004). Bayesian model averaging (BMA) is thus applied in this study. The BMA approach selects a number of possible models and uses the posterior probabilities of these models to perform all inferences and predictions. The frequency of selection of the BMA is greater than that of stepwise selection. In many cases, BMA also provides smaller standard deviations for parameter estimates (Prost et al. 2008). The BMA method selects the correct model and outperforms the stepwise approach in predicting events of interest (Viallefont et al. 2001; Wang et al. 2004).

5.4.2 Qualitative data

The analysis of qualitative data is complex and it is subject to the researcher's biases and values to some extent. Leedy & Ormrod (2005) suggest some strategies in order to minimize these negative influences, for example, collecting two or more different kinds of data, such as observations, interviews related to any particular phenomenon; getting multiple and varying perspectives on any single issue or event. These were adopted in the research design.

Normally the analysis of qualitative data concerns searching the data for patterns for various types (Veal 2005). In this study, the qualitative data were collected in the interview notes, observation notes and transcripts. These documents were read and then summarized,

which was followed by appraising the common points where agreement on a particular aspect was apparent among major interviewees.

Interviewees' statements were supplemented by project documents provided by interviewees. The interpretation was made based on the identified major elements of qualitative data.

5.5 Summary

This chapter describes the research methodology adopted for undertaking this study. Arguments are presented justifying the choice of qualitative and quantitative approach. The data collection and data analysis are explained. The qualitative approach is adopted to develop the theoretical conceptual framework and research hypotheses, which derived from literature review, observations, and preliminary interviews. A quantitative questionnaire survey of practitioners (i.e., contractors and project management personnel of clients) is followed to collect data on specific cultural attributes and performance, and analyses are conducted to investigate correlations between variables.

The data analysis is preliminarily undertaken with using descriptive statistics to provide useful insights. The further specific analyses are factor analysis, ANOVA, correlation analysis, and other statistical tests of significance. To facilitate the analyzing, an appropriate statistical analysis software (i.e., R) is employed to conduct the analyses. Also, a suitable and productive modeling technique is used in the form of multiple regression analysis, which helps to develop comprehensive models that depict the nature and extent to which project organizational culture influences construction project performance.

Chapter 6 Project characteristics, procurement environments, and the culture of construction project organization.

This chapter discusses the characteristics of the projects that were surveyed, and also present an analysis of the data on project organizational culture. Further evaluation to draw out the relationships between the cultural orientations and the project characteristics is also presented to assess the role of the antecedent states as suggested by the conceptual framework.

6.1 Statistical analysis procedures

Questionnaire collected (Appendix C) data in a mixture range of nominal, ordinal and scale type. To analyze these data sets , a variety of statistical procedures were therefore employed, beginning with fundamental descriptive statistics to deeper analysis such as the Freidman rank sum test, factor analysis, Kruskal-Wallis test, and analysis of correlations between the variables. The descriptive statistics comprised frequency distributions, measures of central tendency, such as means, medians and modes, and measures of dispersion such as the standard deviation. These analyses were employed to provide summary descriptions of data and to have an understanding of the nature of the data.

On the other hand, the appropriate tests (i.e., Chi-square ($\chi 2$) test and Friedman rank sum test) were carried out on the significance of the findings. The chi-square test is a non-parametric procedure that tabulates a variable into categories and computes a chi-square statistic to test the hypothesis that the observed frequencies do not differ from their expected values. This goodness-of-fit test compares the observed and expected frequencies in each category to test either that all categories contain the same proportion or user-specified proportions of values. In order to detect significant relationships between some of the nominal variables, the Pearson $\chi 2$ test was applied in cross-tabulations of the variables (Kinnear and Gray, 2004). While, the Friedman test was appropriately applied to test for significant differences in the ranking of related variables (ibid) for the ordinal data. This is a non-parametric test for multiple related samples. Such nonparametric tests are useful because they do not assume that data follow a specific distribution, and are especially appropriate for small samples and can be used with ordinal test variables (Field, 2000).

Factor analysis is a multivariate statistical technique for examining the underlying structure or the structure of interrelationships (or correlations) among a large number of variables (Hair et al., 1998). This analysis yields a set of factors or underlying dimensions which, when interpreted and understood, describe the data in a parsimonious but more meaningful number of concepts than the original individual variables (ibid). This approach was utilized in the seminal work of Hofstede (2001) on culture. Because of the data reduction intention, a suitable method for extraction of factors is PCFA, with the extracted components used to compute new variables for subsequent analyses.

Where there was a need to compare several population means simultaneously, analysis of variance (ANOVA) was applied. Although one-way ANOVA is the method of choice when testing for differences between multiple groups, it assumes that the mean is a valid estimate of centre and that the distribution of the test variable is reasonably normal and similar in all groups (Field, 2000). Where it was not possible to show clearly that these assumptions are satisfied, nonparametric procedures such as the Kruskal-Wallis and Post hoc tests were used to test for the significance of the differences between the mean ranks of the various groups (i.e., whether or not the values of a particular variable differ between two or more groups). The Kruskal-Wallis test is a one-way ANOVA by ranks. It tests the null hypothesis that multiple independent samples come from the same population, i.e., have the same mean rank. The Post hoc test is a non-parametric ANOVA similar to the Kruskal-Wallis, but is applied when there are significant differences in the first step by the Kruskal-Wallis test, detecting the specific difference between two groups. Unlike standard ANOVA, these tests do not assume normality, and can be used for ordinal variables.

A final statistical procedure applied to assess the existence of relationships between variables was the test of correlation. The coefficient describes the strength of the relationship between two sets of interval-scaled or ratio-scaled variables, which could be perfectly related in a positive or negative linear way, and not related. The correlation coefficient (r) lies between –1 and +1. If a correlation coefficient of –1 or +1 indicates perfect correlation, when the r close to 0 shows that the relationship is quite weak, and if there is absolutely no relationship between the two sets of variables, Pearson's r will be zero.

6.2 Project characteristics

Various characteristics relating to projects were examined if their potential influence on the cultural dimensions that developed within the construction project. Analyses of these project characteristics are presented below.

6.2.1 Project type

Table 6.1 summarizes the types of projects that were captured in the questionnaire survey (refer to Appendix D for detailed output). As can be seen from Table 6.1, the projects were fundamentally classified by type of facility constructed, type of client, and scale. Each category is presented in the number of cases and the percentage equivalent, and the total volume of output for each category as expressed in percentage terms. In terms of the number of projects captured in the survey, state/public sector funding category constituted the biggest proportion of the investment. Majority of the projects were either Transportation infrastructure or building with medium scale based budget invested.

Table 6.1 Project type descriptions

Project type	**Projects surveyed (N)**	**Projects surveyed (%)**
Proj_type1		
Transport infrastructure (T)	107	54.0
Building (B)	78	39.5
Industry (I)	6	3.0
Factory (F)	4	2.0
Water system (W)	3	1.5
Total	198	100
Proj_type2		
State funded	107	54.0
Private funded	48	24.3
Over sea funded	43	21.7
Total	198	100
Proj_type3		

Big scale (National level)	49	25.6
Medium scale (Budget >15 bil. VND)	113	59.2
Small scale (Budget <=15 bil. VND)	29	15.2
Total	191	100

6.2.2 Complexity

The complexity level of the projects surveyed in respect of technical issues was rated by respondents. This characteristic of projects assumes that the more complexity of project, the more cooperation of participants in working collaboratively to problem-solve and completing the project successfully. As shown in Figure 6.1, almost 57% considered their projects to be either simple or moderately complex. Median rating for project complexity on the scale of 1 to 5 was found to be 3 (Table 2, Appendix D).

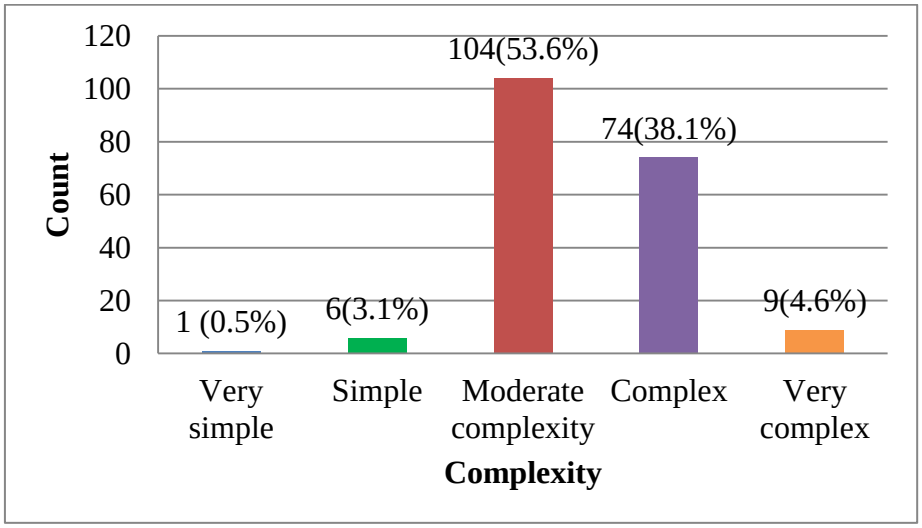


Figure 6.1 Distribution of the complexity level of projects

6.2.3 Influence of Participants

The level of influence of project participants was examined (Table 6.2). The order of the mean level are the client, decision maker, main contractor, supervision consultant, project manager, and sub-contractor; in that order, the client is perceived as the most influential of all the project participants with a mean rating of 4.39 and standard deviation of 0.811. This finding is not aligned with the literature (cf. Egan, 1998; Xiao, 2002) which identifies the main contractor as the principal participant and the main driver of the project. However, this finding is supported by the notion that when a price-based (i.e., low-bid or traditional procurement) environment is applied, the client who assumes a great deal of power in

managing, directing, and controlling the project (Kashiwagi et al. 2012). The Friedman test was employed to establish the significance of the differences shown in Table 6.2. The output obtained (Table 6.3), indicates clearly that there is a significant difference between the levels of influence of these key participants ($\chi 2 = 243.437$, $p < 0.000$). The differences in the levels of influence of the various participants are not just due to chance.

Table 6.2 Level of influence of project participants

Participants	N	Mean	Std. Deviation	Minimum	Maximum	**Rank**
Infl_dc	183	4.01	1.19	1.00	5.00	2
Infl_client	183	4.39	.81	2.00	5.00	1
Infl_pm	183	3.67	.85	1.00	5.00	5
Infl_sup	183	3.70	.87	1.00	5.00	4
Infl_main.c	183	3.90	.94	1.00	5.00	3
Infl_sub.c	183	2.92	1.06	1.00	5.00	6

Table 6.3 Friedman test on levels of influence of project participants

Participants	Mean Rank	Friedman Test
Infl_dc	3.98	N=183 $\chi 2$ =243.437 df=5 P_{value}=.000
Infl_client	4.61	
Infl_pm	3.29	
Infl_sup	3.31	
Infl_main.c	3.74	
Infl_sub.c	2.07	

6.2.4 The performance ethos

Participants were asked to rank the priority of their selected project in respect of cost, time, quality, and safety and environment (s&e) with 1 representing topmost priority or most important and 4 representing the least important. In terms of the mean ranking (Table 6.4), it appears that on construction projects generally, contrary to popular belief, cost is not the most important consideration. Cost ranks third behind quality which is ranked as the most important and time which is ranked second most important. This result may be indicative of the changing attitudes and culture of the construction industry in respect of quality, which has been receiving much attention in Vietnamese construction industry. It may also be indicative of the effectiveness of the quality assurance failing to meet the specification requirement. Indeed, poor performance of quality in the Vietnamese construction industry is emerging main problem and this may be attributable in part to this changing ethos. This finding also is supported by Nguyen and Watanabe (2014) that poor quality, delay, and cost over-run are the main problems of project delivery in Vietnam.

Table 6.4 Priority on project performance

	N	Mean	Std. Deviation	Minimum	Maximum	**Rank**
Prior_cost	190	2.5263	1.15325	1.00	4.00	3
Prior_time	190	2.3737	.92143	1.00	4.00	2
Prior_qual	190	1.6105	.76697	1.00	4.00	1
Prior_s&e	190	2.9053	1.18700	1.00	4.00	4

The performance ethos is thus quality–time-cost–safety & environment. Here also, the Friedman test was applied to these rankings in order to test the significance of these findings. The Friedman procedure tests the null hypothesis that multiple ordinal responses come from the same population. The data may come from repeated measures of a single sample or from the same measure from multiple matched samples. For a constant sample size, the higher the value of this chi-square statistic is, the larger the difference between each variable's rank sum and its expected value are. The output is shown in Table 6.5

From this output it can be seen that there is a large chi-square value ($\chi 2$= 118.159, p < 0.000) implying that there is strong evidence to reject the null hypothesis that there is no difference in the priority placed on the different objectives project organizations pursue. Clearly, the levels of priority placed on the various objectives are significantly different from each other, and quality is the most important objective that most projects pursue.

Table 6.5 Friedman test on levels of project priority

	Mean Rank	Friedman Test
Prior_cost	2.69	N=190
Prior_time	2.51	$\chi 2$ =118.159
Prior_qual	1.73	df=3
Prior_s&e	3.07	P_{value}=.000

6.3 Procurement characteristics

6.3.1 Procurement method

In terms of procurement routes adopted on the 199 projects representing the sample, the Traditional route (DBB) dominated as the most popular procurement approach with 75% of the projects procured this way. Following this with 11% is the EPC approach. BOT, BT, and BOO were the approach for procuring 8%, 5%, and 1% of the projects surveyed respectively. There is no other procurement approaches such as Management Contracting, Construction Management, and Private Finance Initiative (PFI) of all projects assessed.

The chi-square ($\chi 2$) test was conducted on these procurement types to test the null hypothesis that they are equally distributed in the population. The output shows clearly that the differences suggested by Figure 6.2 are highly significant and not due to chance ($\chi 2$= 371.225, df =4, p-value < 2.2e-16). This implies that there is very strong evidence to show that the traditional procurement approach is still the most popular among others. Similarly, this profile shows somewhat similar to survey findings reported for the year 2004 in an RICS report (RICS, 2006), the general trend of the traditional lump sum procurement approaches and the Design and Build routes were still the most popular in UK construction industry.

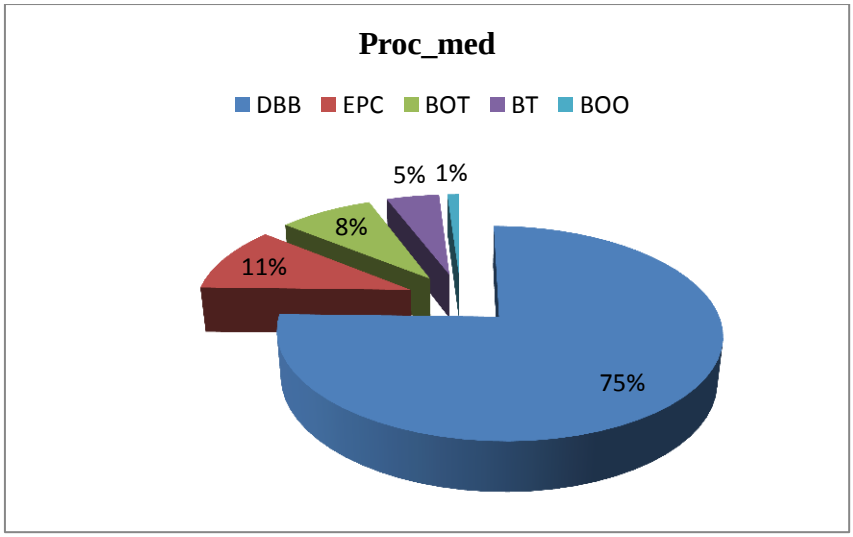


Figure 6.2 Distribution of procurement methods

6.3.2 Bid method

It is indicated that among the three methods implemented on the 199 projects representing the sample, the Competition route is dominated as the most popular bid approach with 62% of the projects bid. Following this with 24% and 14% are the Designated/Negotiated and Limited approach respectively of the projects surveyed.

The chi-square ($\chi 2$) test was conducted on these procurement types to test the null hypothesis that they are equally distributed in the population. The output shows clearly that the differences suggested by Figure 6.3 are highly significant and not due to chance ($\chi 2$= 75.8477, df = 2, p-value < 2.2e-16). This implies that there is very strong evidence to show that the Competition approach is still the most popular among others.

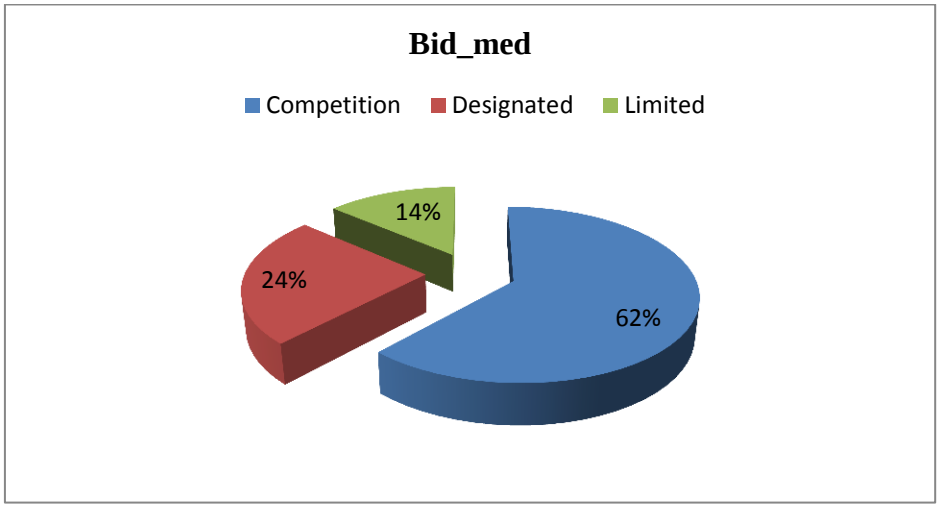


Figure 6.3 Distribution of bid methods

6.3.3 Bid evaluation

To investigate the bid evaluation on the 199 projects surveyed, four principles representing as the existing concerns of the tendering evaluation adopted from Nguyen and Watanabe (2014) were measured including (i) f*air and transparent competition (Bid_f.t1), (ii) no intervention to bid process (Bid_intl2), (iii) trust on past performance (Bid_past3), and (iv) reasonable capability of contractor on site (Bid_cap4)*. The respondents were also asked to what extent of their agreement on the four criteria indicated by using the five point-scale format item. The general descriptive statistic is shown in the Table 6.6.

Table 6.6 Statistical description of bid evaluation

Criteria	Coding	n	mean	sd	median	min	max	se
Fair and transparent competition	Bid_f.t1	197	3.21	0.99	3	1	5	0.07
No intervention to bid process	Bid_intl2	197	3.07	1.00	3	1	5	0.07
Trust on past performance	Bid_past3	196	3.61	0.75	4	1	5	0.05
Reasonable capability of contractor on site	Bid_cap4	196	3.62	0.81	4	1	5	0.06

The mean scores show that all these criteria were rated in the range of neural to closed high level (from 3.0-4.0). It implied that there is a possibility to improve these criteria to achieve a better biding evaluation.

In terms of testing for significant differences in these various bid evaluation criteria found, the hypothesis that were put forward to the testing were that: There are no differences in the bid evaluation criteria regardless of either their project characteristics or procurement approach. By using the Kruskal_Wallis method, each of four criteria of bid evaluation was tested and the results are presented in the Table 6.7.

Table 6.7 Kruskal_Wallis test results

	Statistics	Bid_f.t1	Bid_intl2	Bid_past3	Bid_cap4
Proj_type1	chi-squared	4.524	6.971	9.180	3.279
	df	4	4	4	4
	p-value	0.339	0.137	0.057	0.512
Proj_type2	chi-squared	1.271	1.726	0.847	2.814
	df	2	2	2	2
	p-value	0.529	0.422	0.655	0.245
Proj_type3	chi-squared	0.312	0.244	4.337	3.281
	df	2	2	2	2
	p-value	0.855	0.885	0.114	0.194
Proc_med	chi-squared	0.388	0.809	3.186	1.186
	df	2	2	2	2
	p-value	0.823	0.667	0.203	0.552
Bid_med	chi-squared	2.235	9.191	0.057	4.374
	df	2	2	2	2
	p-value	0.327	**0.01009**	0.971	0.112

The results show that there was no evidence to suggest that the project characteristics and procurement approach have an effect on the bid evaluation criteria except for the significant effects of the bid method (Bid_med) on the *no bid intervention criterion* (Bid_intl2). The Kruskal_Wallis post hoc analysis was thus employed to figure out this specific difference (Table 6.8). The data indicates that there is a significant difference in the *no bidding intervention criterion* (Bid_intl2) between the Competition and Limited method. The level of the bid intervention of the Limited route is significantly higher (mean =2.56, Table 6.9) than that of the Competition route (mean=3.19, Table 6.9). The revelation may well explain that the competitive measure is typically considered as the productive instrument to archive the transparent bid; while the limited manner could be attributable to collusive phenomenon of bidding players.

Table 6.8 Kruskal_Wallis post hoc analysis results

Test	Comparisions	obs.dif	critical.dif	difference
Bid_intl2 vs	Competition-Designated	3.619	23.376	FALSE
Bid_med	Competition-Limited	34.651	28.734	**TRUE**
	Designated -Limited	31.032	32.754	FALSE

Table 6.9 Descriptive of the *no bid intervention criterion* (Bid_intl2).

Bid_med	n	mean	sd	median	min	max	se
Competition	122	3.19	1.01	3	1	5	0.09
Designated	46	3.09	1.01	3	1	5	0.15
Limited	27	2.56	0.80	2	1	5	0.15

6.4 Summary of project characteristics

Most of the projects captured in this survey were public sector new work in the infrastructure building category, specifically transportation projects. This outcome is not surprising since the public sector has been noted as the most vital role in developing the infrastructures in Vietnam for over years. Most of these projects were considered by respondents to be either moderately complex or simple, where complexity is a measure of the difficulty of executing the individual parts of the construction project and/or bringing these parts together in a unified whole (Gidado, 1996). This makes sense considering the range of projects that contractors undertake from simple jobbing projects to very complex mega projects. In terms of the procurement characteristics of these projects, a majority of these projects (75%) had been procured by traditional procurement approach; Competition route is known as the most popular of all bid methods (62%). Not surprisingly, client was reported as the most influential participant in the course of project. The performance ethos of Vietnam construction project organizations was found to be in the order quality–time-cost–safety & environment with quality as the most important and safety & environment as the least

important. As argued earlier, this seems to suggest a shift in priorities from what obtains traditionally as reported in Xiao (2002) where cost is widely considered as the most important objective. It can be concluded from the above findings that generally the sample is representative, or at least broadly reflective, of construction projects in the Vietnam. Projects of all kinds, procured under different arrangements, and across the entire Vietnam are represented in the sample.

6.5 Detecting the project organizational culture

6.5.1 Development of project organizational culture artifacts

To explore project organizational culture artifacts, dimensions are widely used in describing organizational culture because of their flexibility to reflect the value being assessed (Cheung et al., 2012). To identify each project's organizational culture, it was therefore necessary to examine the sources of those dimensions. Cultural dimensions are rooted in fundamental problems that a group of people must address or for which they must find solutions (Hofstede, 2001; Schein, 1985). Thus, when looking for the dimensions of construction project organizational culture, one could argue that a useful source of information is the fundamental practices experienced by project participants during project delivery. In this study, sources of the industry's problems were initially examined by consulting with selected experts. On the other hand, models for organizational culture were reviewed for the compilation of a list of cultural artifacts. From the perspective of the definition of project organizational culture, it is proposed that project organizational culture can be identified by adapting these artifacts to relevant participants' behaviors during the course of a project.

The preliminary interviews were conducted with 21 practitioners who worked for both clients (10 participants) and contractors (11 participants) in the primary role of project manager or senior engineer. The respondents were asked to explore reasonable cultural artifacts based on their own experiences with industry difficulties (Table 6.10) and to propose suitable performance indicators for an industry survey (Table 4.1). The interviews were conducted face-to-face in a semi-structured manner. Each interview lasted approximately one hour. After the interviewee provided a brief description of his or her experiences, the primary questions were asked, and then additional questions were added as warranted. A selection of primary questions is listed below:

(1) What are the core problems of the industry?

(2) Could you describe those problems in detail?
(3) Have you ever heard of culture as a general concept or from the perspective of project management?
(4) What do you understand about culture at the project level?
(5) How would you describe project organizational culture?
(6) Based on the list of organizational culture artifacts derived from the literature, what are reasonable measures of project organizational culture?
(7) How would you describe performance indicators?
(8) In your experience, which performance indicators do you think are reasonable for measuring performance? Which performance indicators would be difficult to measure?
(9) In your experience, what types of participant behavior or attitudes during project delivery lead to good or poor performance?

The experts were also provided with the compilation of a list of cultural artifacts to help clarify the notion of cultural attributes and were then asked related questions about the above-mentioned attributes and behaviors.

The results show that the interviewed experts identified five types of industry problems: *(i) common goal concerns*, which relate to participant responsibility for project goals, clear objectives for participants, participant commitment to achieve project goals, and conflicts of interest; *(ii) work environment concerns*, which relate to information sharing, the openness of the environment, support from top management, mutual trust among participants, mutual respect among participants, and the assignment of blame in the event of disruptions; *(iii) employee concerns*, which include work conditions, employee participation in decision making, employee training, and the treatment of workers with respect; *(iv) contract commitment issues*, which relate to contractor commitment to project performance, client commitment to the agreement, and the accountability of supervisors; and *(v) hierarchy and management issues*, which include the competency of the project manager, communication between the project manager and subordinates, and participant involvement in decision making. These explorations are also supported by statement in other investigations (i.e., Nguyen and Watanabe 2014; Ling and Hoang 2010; Ling and Bui 2010; Ling et al. 2009; Nguyen et al. 2004).

Subsequently, 29 culture artifacts were also identified as explanatory factors in the five industry problems (Table 6.10).

Table 6.10 Identified relationships between core construction industry problems and cultural artifacts in Vietnam

Core industry problems identified	Cultural artifacts derived from industry problems.	Related references
Common goal concerns	▪Understanding of objectives	▪Denison (2000); Olanipekun et al. (2014).
	▪Roles and duties of contractor	▪Hansen and Wernerfelt (1989); Bettinger (1989); Denison et al. (1990); Liu (1999).
	▪Roles and duties of client	▪Hansen and Wernerfelt (1989); Bettinger (1989); Denison et al. (1990); Liu (1999).
	▪Mutual understanding	▪Hansen and Wernerfelt (1989); Bettinger (1989); Denison et al. (1990); (Liu 1999).
	▪Looking forward to project benefits	▪Hofstede (1997).
Work environment issues	▪Effective working relationships	▪Denison (2000); Khan et al. (2010).
	▪Information sharing	▪Cameron and Quinn (1999); Kessel et al. (2014).
	▪Encouragement of project manager	▪Uher and Loosemore (2004).
	▪Mutual trust	▪Hofstede (1983); Bettinger (1989); Lau at el. (2007).
	▪Mutual respect and openness	▪Uher and Loosemore (2004); Khan et al. (2010).
	▪Exchange of ideas and support	▪Liu (1999); Kessel et al. (2014).
	▪Blame assignment and accountability	▪Hofstede (2001).
Employee concerns	▪Importance of people's contributions	▪Harrison (1972); Handy (1985); Hofstede (2001); Olanipekun et al. (2014).
	▪Available opportunities	▪Bryde and Robinson (2005); Khan et al. (2010).
	▪Empowering assignments	▪Deal and Kennedy (1982).
	▪Recognition of achievements	▪Deal and Kennedy (1982).
	▪Training sessions	▪Denison (2000; Davis (2014).
	▪Respect for workers	▪Khan et al. (2010).
	▪Concern for workers	▪Khan et al. (2010).
Contract commitment concerns	▪Contractor commitment to quality	▪Denison (2000); Thompson (1993).
	▪Contractor commitment to schedule	▪Egan (1998).
	▪Contractor commitment to budget	▪Thompson (1993).
	▪Supervisor commitment to work	▪Cserháti and Szabó (2014).
	▪Client commitment to agreements	▪*Omran et al. (2012).*
Hierarchy and management issues	▪Leaders' leadership	▪Denison (2000); Kashiwagi et al. (2012).
	▪Encouragement of decision making	▪Kashiwagi et al. (2012).
	▪Leaders' direction	▪Carvalho et al. (2015); Denison (2000).
	▪Leaders' instruction	▪Pheng Low and Shi (2001); Quinn (1988); Gasik (2011).
	▪Involvement in decision making	▪Cameron and Quinn (1999).

PCFA was then employed to test the factor structure of the 29 cultural artifacts and to establish the extent to which any underlying factors tallied with the *a priori* item classification. The eigenvalue, which is commonly used to establish a cutoff, is most reliable when the number of artifacts is between 20 and 50 (Hair et al. 1998). Because the number of

artifacts in this study is 29, the use of the eigenvalue criterion was appropriate. Factors with eigenvalues greater than or equal to 1 were considered significant.

6.5.2 Factors in project organizational culture and internal consistency

The results of the PCFA (Table 6.11) using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test show that the data are suitable for factor analysis. The KMO value is 0.924, which is above the suggested threshold of 0.6 (Cheung et al. 2011). The low significance of Bartlett's test also satisfies requirements (Hair et al. 1998). The results of the exploratory factor analysis with the commonly used varimax rotation and an eigenvalue that is greater than one for the remaining items show a pattern of loadings consistent with our theoretical expectations. Factor loadings of 0.4 or greater were considered (Field 2000; Cserháti and Szabó 2014). The final factor loading matrices show that the five culture components that were initially extracted account for 62.488% of the total variance in the 29 dimensions of culture, which is considered sufficient to explain project culture based on the extracted artifacts (Sharma 1996). All Cronbach's alpha values range from 0.658 to 0.900, which suggests that all factors have acceptable internal consistency reliability (Cserháti and Szabó 2014).

Eleven artifacts were extracted as significant in cultural factor 1: (i) objective understanding; (ii) the roles and duties of the contractor; (iii) the roles and duties of the client; (iv) mutual understanding; (v) information sharing; (vi) encouragement of the project manager; (vii) mutual trust; (viii) the importance of people's contributions; (ix) available opportunities; (x) supervisor commitment; and (xi) leadership. Referring to the artifact descriptions provided in Table 3, artifacts (i–iii) can be used to evaluate the effectiveness of goal setting in project delivery. The remaining artifacts in cultural factor 1 can be used to assess the extent to which people are trusted to achieve project goals. This project organizational culture factor is called *goal alignment and trust*.

Cultural factor 2 comprises nine artifacts: (i) looking forward to the project benefits; (ii) effective working relationships; (iii) openness and mutual respect; (iv) the exchange of ideas and support; (v) accountability and assignment of blame; (vi) recognition of achievements; (vii) client commitment to agreements; (viii) leaders' instruction; and (ix) involvement in decision making. The artifacts encompassed by factor 2 relate to the creation of a cooperative working environment. Thus, cultural factor 2 is labeled *cooperative orientation*.

Three artifacts are loaded significantly in cultural factor 3: (i) contractor commitment to quality; (ii) contractor commitment to schedule; and (iii) contractor commitment to budget. These artifacts concern the extent to which a contractor is committed to project performance. Thus, cultural factor 3 is called *contractor commitment*.

Cultural factor 4 is called *worker orientation* and comprises three artifacts that can be used to evaluate the extent of concern for the workforce: (i) training sessions; (ii) respect for workers; and (iii) concern for workers.

Three artifacts are extracted for the taxonomy of factor 5: (i) empowering assignments; (ii) encouragement of decision making; and (iii) leaders' direction. This cultural factor is labeled *empowerment orientation* because the extracted artifacts can be used to assess the level at which empowered individuals are involved in making decisions regarding the achievement of the project goals.

In summary, the five project organizational culture dimensions for the construction industry that were derived from the factor analysis are as follows: (i) *goal alignment and trust*; (ii) *cooperative orientation*; (iii) *contractor commitment*; (iv) *worker orientation*; and (v) *empowerment orientation*. Collectively, these factors form a structural framework of project organizational culture in the construction industry. These five clusters provide a broad classification of cultural types, and provide empirical evidence that there are diversities in the cultures of construction project organizations working on different construction projects in Vietnam.

To rank these culture dimensions, factor scores were calculated based on the average mean scores of each factor's artifacts. The project organizational culture factors were then ranked in descending order based on their scores, as shown in Table 6.12 and Figure 6.4.

Table 6.11 Factors of cultural artifacts

Cultural artifacts		Component				
		1	2	3	4	5
Objective understanding	CG1	.716				
Roles and duties of contractor	CG2	.520		.507		
Roles and duties of client	CG3	.644				
Mutual understanding	CG4	.724				
Looking forward to project benefits	CG5		.478			
Effective working relationships	CC1	.444	.479			
Information sharing	CC2	.577				

Encouragement given by project manager	CC3	.498		.414		
Mutual trust	CC4	.535				
Openness and mutual respect	CC5	.466	.592			
Exchanges of ideas and support	CC6	.421	.569		.400	
Accountability and assignment of blame	CC7		.645			
Importance of people's contributions	CP1	.537				
Available opportunities	CP2	.525			.413	.401
Empowering assignments	CP3					.581
Recognition of achievements	CP4		.412			
Training sessions	CP5				.739	
Respect for workers	CP6				.787	
Concern for workers	CP7				.779	
Contractor commitment to quality	CCM1			.743		
Contractor commitment to schedule	CCM2			.839		
Contractor commitment to budget	CCM3			.789		
Supervisor commitment	CCM4	.512				
Client commitment to agreements	CCM5	.404	.441			
Leaders' leadership	CH1	.466	.411			
Encouragement of decision making	CH2					.770
Leaders' direction	CH3		.408			.613
Leaders' instruction	CH4		.697			
Involvement in decision making	CH5		.624			
Eigenvalue		12.471	1.856	1.493	1.233	1.069
Variance (%)		43.003	6.399	5.149	4.252	3.686
Internal consistency reliability (Cronbach's alpha)		0.900	0.887	0.873	0.882	0.658
Kaiser-Meyer-Olkin measure of sampling adequacy	0.924					
Bartlett's test of sphericity						
Approx. chi-square	3.130E3					
dif.	406					
sig.	.000					

Table 6.12 Significance scores of project organizational culture dimensions

No.	Value dimensions	Cultural artifacts	Score (ranking)
1	*Goal alignment and trust (C1)*	• Objective understanding • Roles and duties of contractor • Roles and duties of client • Mutual understanding • Information sharing • Encouragement given by project manager • Mutual trust • Importance of people's contributions • Available opportunities • Supervisor commitment • Leaders' leadership	3.75 (1)
2	*Contractor commitment (C2)*	• Contractor commitment to quality • Contractor commitment to schedule • Contractor commitment to budget	3.53 (2)
3	*Cooperative orientation (C3)*	• Looking forward to project benefits • Effective working relationships • Openness and mutual respect • Exchanges of ideas and support • Accountability and assignment of blame • Recognition of achievements • Client commitment to agreements • Leaders' instruction • Involvement in decision making	3.40 (3)
4	*Empowerment orientation (C4)*	• Empowering assignments • Encouragement of decision making • Leaders' direction	3.30 (4)

5	*Worker orientation (C5)*	• Training sessions • Respect for workers • Concern for workers	3.03 (5)

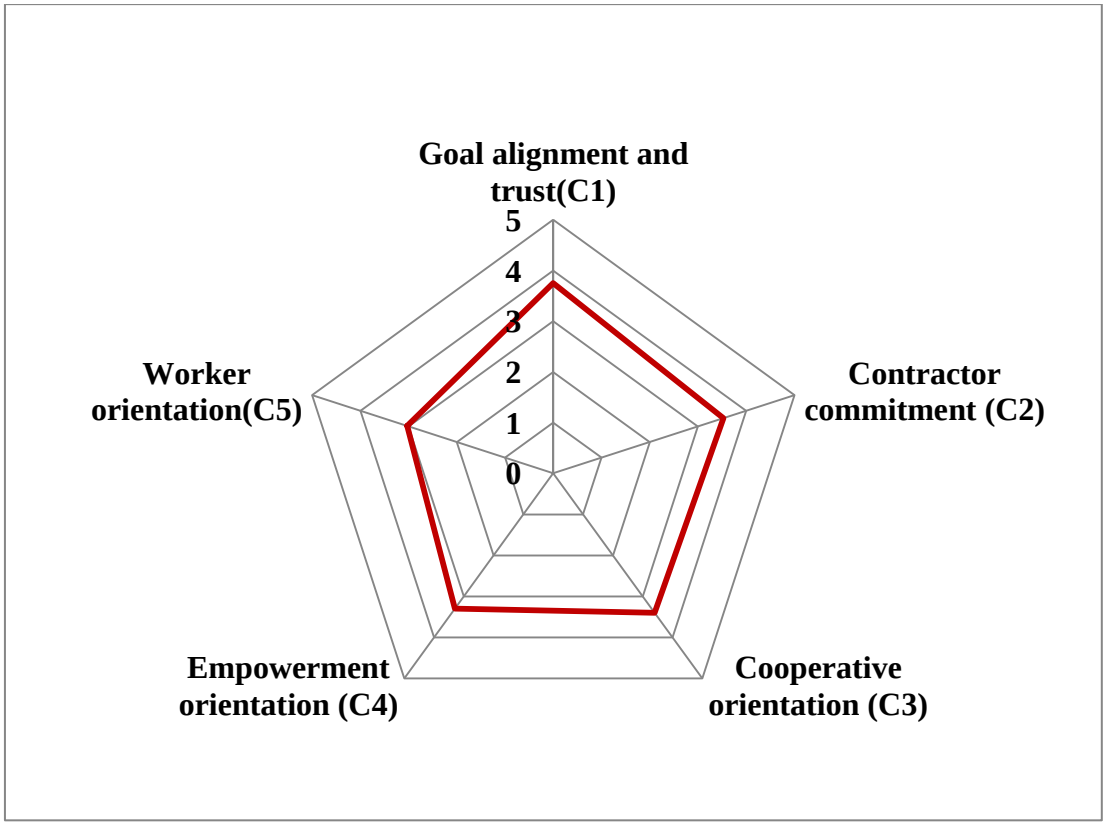


Figure 6.4 Project organizational culture dimensions

The significance scores of these five factors can be divided roughly into three groups: the top two (above 3.50), the next two (between 3.30 and 3.40) and the last one (just above 3.00). Based on a scale of five, these scores indicate that the factors are above-average identifiers of project organizational culture in the construction industry.

The first group, 'goal alignment and trust', was ranked highest. This finding is consistent with that of Cheung et al. (2011), who found that 'goal setting and accomplishment' had the highest score among organizational culture dimensions in the construction industry. This finding clearly supports the notion that a project organization is identified by its culture, which in turn is determined by the goals that are set, manifested by the approach taken and crystallized by the actions implemented by the organization. In other words, clear goals instruct the formulation of strategies and an action plan. Unless these goals are changed, the

actions that may be taken by the organization to achieve its goals are believed to be consistent and predictable. In addition, the development of trust and mutual understanding engender harmony among participants, which reduces risk for all involved parties and builds relationships that establish a rapport among participants before the project implementation phase (Walker and Rowlinson 2008). The second-highest ranked factor is 'contractor commitment'. The relatively high ranking of this project organizational culture factor aptly reflects the emphasis placed on contractor commitment in construction project organizations.

The second group comprises two factors with similar organizational culture factor scores, namely, cooperative orientation and empowerment orientation. Due to the fragmented nature of the construction industry, a highly cooperative orientation characterized by the free exchange of ideas, coordination, and the sharing of accountability among construction project members is often a prerequisite for project success. By cooperating, project participants aim to reduce overall project costs, share project risks and rewards, and increase mutual profits (Das and Teng, 1998; Hutchinson and Gallagher, 2003). Furthermore, by empowering employees to speak up and be heard, organizations are "using their greatest asset to its highest potential and, in return, are becoming more competitive in the emerging global economy." (Maxwell, 2005). In organizations without employee empowerment cultures, it may be inappropriate for employees to offer feedback or suggestions to management, despite the fact that such feedback improves performance.

The lowest-ranked factor is 'worker orientation,' which has a neutral score. This finding is not surprising and in fact reinforces Egan's (1998) argument that the construction industry continues to fail to recognize that its workforce is its greatest asset and hence there is a need to invest in training and development, health and safety, decent site conditions, and fair wages. This failure also encompasses a lack of concern for the environment and sustainability issues because these factors also relate to a concern for people, albeit people in society in general. It is not surprising that the construction industry has one of the worst industry records for health and safety and a poor record for recruitment and retention (Fellows et al. 2002; Pearce 2003).

6.5.3 Analysis of variance (ANOVA)

The contracting organizations in a construction project have different backgrounds and business objectives; thus, the representativeness of the identified project organizational culture factors may vary across contracting organizations. In this regard, analysis of variance (ANOVA) was conducted to determine whether there is a significant difference in the

perceived significance of the identified project organizational culture factors between the two groups of respondents: clients and contractors. The results are summarized in Table 6.13. The significance scores of the five project organizational culture factors are all greater than 3.0 on a 5-point Likert scale. This finding indicates that the two groups of respondents regard all of these factors as appropriate for identifying project organizational culture in construction. Furthermore, as indicated in Table 5, at a 99% confidence level (i.e., at the $q<0.01$ level), the group differences in mean scores for the five project organizational culture factors are not significant. The ANOVA results of this study indicate that despite their association with different types of organizations, there is no evidence to suggest that the two types of respondents have different views regarding project organizational culture in the construction industry.

There is a general belief that due to differences in business objectives, leadership styles, life cycles, and work patterns, the contracting organizations in construction may develop different cultures (Ankrah and Langford, 2005; Cheung et al., 2011). However, the ANOVA results do not reveal a significant difference between clients and contractors in terms of project organizational culture in the construction industry, as shown in Table 6.13. As such, both groups of respondents agreed that the five factors identified by the PCFA are valid measures of project organizational culture in the construction industry. The acceptance of these factors by the two groups of construction professionals suggests that the proposed framework can be used as a foundation for project organizational culture features in future investigations.

Table 6.13 Analysis of variance (ANOVA) results

	Statistics	Goal alignment and trust (C1)	Contractor commitment (C2)	Cooperative orientation (C3)	Empowerment orientation (C4)	Worker orientation (C5)
Clients	Mean significance score SD	3.83 0.54	3.34 0.86	3.53 0.66	3.42 0.72	3.14 0.91
Contractors	Mean significance score SD	3.75 0.72	3.57 0.72	3.38 0.64	3.28 0.64	3.02 0.99
ANOVA (Kruskal-Wallis test)	Chi-squared P-value	0.494 0.482	1.748 0.186	1.269 0.260	0.983 0.322	0.293 0.588

6.5.4 Investigation of the influence of project characteristics and procurement characteristics on project culture

To investigate the relations, some of them were put to the test using the Kruskal-Wallis and the *post hoc* analysis where the variables involved were nominal; while the Spearman's correlation was employed where the variables involved were treated as ordinal or scale. Each of the five dimensions of culture was tested and the results are presented in Table 6.14 and Table 6.16.

It could be observed from Table 6.14 that there was no evidence to suggest that the project characteristics such as participant type who were 169 contractors and 30 clients of the respondents surveyed (Type_Par), nature of fund (Proj-type2), and project size (Proj_type3) as well as procurement aspects regard of procurement route (Proc_med) and bid method (Bid_med) have an effect on the project culture.

Table 6.14 Kruskal-Wallis test results

	Statistics	C1	C2	C3	C4	C5
Type_Par	chi-squared	0.4944	1.7481	1.2685	0.9829	0.2934
	p-value	0.4820	0.1861	0.2600	0.3215	0.5880
Proj_type1	chi-squared	9.2226	4.4433	9.6427	8.7356	15.4782
	p-value	0.0557	0.3493	**0.0469**	0.0680	**0.0038**
Proj_type2	chi-squared	0.4979	2.0259	2.311	2.1263	1.4264
	p-value	0.7796	0.3632	0.3149	0.3454	0.4901
Proj_type3	chi-squared	0.5633	2.916	0.2309	0.2449	1.1995
	p-value	0.7545	0.2327	0.8910	0.8847	0.5490
Proc_med	chi-squared	0.325	4.4425	4.2979	2.4069	6.0084
	p-value	0.9881	0.3494	0.3672	0.6614	0.1985
Bid_med	chi-squared	2.9462	1.8715	1.2579	0.5925	1.8721
	p-value	0.2292	0.3923	0.5331	0.7436	0.3922

However, the significant differences were found on two culture dimensions of the cooperative orientation (C3) and the worker orientation (C5) for the type of project (Proj_type1).The Kruskal_Wallis *post hoc* analysis was thus employed to figure out these specific differences. The results reveal no difference in the culture of cooperative orientation

regard of the project type. In contrast, from the Table 6.15, the data indicates that there is a significant difference in the worker orientation (C5) between transportation infrastructure (T) and building facility (B). It further means that the level of worker orientation of the transport infrastructure facility (mean =3.24, Table 6.16) is significantly higher than that of the building facility (mean=2.47, Table 6.16). This revelation may well be explained by the reality that the workers in the contractors involved building facilities are widely maintaining as temporary employment; in contrast to those of transportation infrastructures are long-run contracted in long-standing state-owner corporations.

Table 6.15 Kruskal_Wallis post hoc analysis results of worker orientation (C5)

Comparisons	obs.dif	critical.dif	difference
B-F	33.5608974	82.46046	FALSE
B-I	21.4358974	68.14482	FALSE
B-T	32.8120657	23.94765	**TRUE**
B-W	8.3525641	94.63477	FALSE
F-I	12.1250000	103.82705	FALSE
F-T	0.7488318	81.91355	FALSE
F-W	25.2083333	122.84983	FALSE
I – T	11.3761682	67.48199	FALSE
I – W	13.0833333	113.73684	FALSE
T-W	24.4595016	94.15860	FALSE

Table 6.16 Descriptive of Worker orientation (C5).

Proj_type1		n	mean	sd	median	min	max	se
Building	(B)	78	2.47	0.84	2.67	1.33	5.00	0.10
Factory	(F)	4	3.25	0.74	3.34	2.33	4.00	0.37
Industry	(I)	6	3.06	0.65	3.00	2.00	4.00	0.26
Transport Inf.	(T)	107	3.24	0.95	3.33	1.00	5.00	0.09
Water sys.	(W)	3	2.89	0.84	3.00	2.00	3.67	0.49

The correlation between independent variables and dependent variable was examined using bivariate correlation analysis. From the Table 6.17, it could be observed that there is a positive correlation between bid evaluation principles and the project organizational culture dimension (correlation coefficient above 0.35), which means that when one variable changes, the other variable also changes in accordance with it in a positive direction. This statistical revelation indicates that the bid evaluation could therefore be the significant factor motivating participants to enhance positive behaviors during the course of project.

Table 6.17 Correlation coefficient between bid evaluation and project organizational culture

		C1	C2	C3	C4	C5
Bid_f.t1	Pearson Correlation	.539**	.480**	.514**	.437**	.566**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _intl2	Pearson Correlation	.463**	.419**	.457**	.448**	.522**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _past3	Pearson Correlation	.398**	.498**	.353**	.303**	.369**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _cap4	Pearson Correlation	.538**	.640**	.481**	.379**	.424**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

6.6 Summary

The findings show that the characteristics of project such as type of participant, project size, and fund of project do not influence project organization culture. However, we have demonstrated that the cultural dimension of worker orientation is significantly different in project type with regard to transport infrastructure and building facility. The study also reveals that the bid evaluation principles in regard to fair and transparent competition, no intervention of bid process, trust on past performance of bidder, reasonable capability of contractor on site were positively correlated with project culture. The authors expect that bid evaluation principles would be a key factor motivating the culture change. For further assessing the effectiveness of culture change, the impacts of project organizational culture into project outcomes are needed and would provide a significant contribution to reinforce the theory of organizational behavior within project level.

Chapter 7 Project performance outcomes

This chapter assesses the performance of construction projects in the Vietnam, where performance is the degree to which the project objectives are achieved. The performance of the construction project was assessed on the basis of the various outcomes pursued by stakeholders. As discussed in chapter 4, this research adopted eight primary performance indicators including satisfaction of client with quality, satisfaction of client with time, satisfaction of client with cost, satisfaction of client with safety and environment, profitability satisfaction, labor productivity, lessons learned, and overall performance. Discussions on these various outcomes are presented in this chapter.

7.1 Analytical procedures

A diversity of statistical measures was employed in the analyses of the data, which was started with fundamental descriptive statistics to the more difficult measures such as factor analysis and ANOVA. The descriptive statistics (i.e., frequency distributions, measures of central tendency such as means, medians and modes, and measures of dispersion such as the standard deviation) were conducted to provide summary descriptions of the performance levels of the projects. Finally, Kruskal-Wallis test, the nonparametric statistical analysis, was used to test for the significance of the differences between the mean ranks of the performance variables for different projects (i.e. whether or not the values of a particular performance variable differ between two or more groups).

7.2 Descriptions of the principal performance measures

In order to obtain an overall picture of the levels of performance of the construction projects captured in the survey, various performance measures were assessed based on Table 4.1 (chapter 4). Principal among these measures were cost, time, quality, S&E, productivity, learning, profitability, and overall performance. These measures were evaluated individually, and the findings are outlined below.

7.2.1 Satisfaction of participants

7.2.1.1 Quality performance (QP)

A measure of QP was conducted by assessing the level of client satisfaction with quality (Table 7.1). Mean rating for client satisfaction was found to be 3.72 with standard deviation 0.68. As can be seen from Table 7.2 below, 67.3% were either satisfied or very satisfied with quality. This seems to be consistent with the previous claim (chapter 6) that quality is ranked as the most important of project priorities. One logical interpretation could be that clients of the construction industry will be satisfied with quality as long as contractors fulfill the works without significant defects that adversely affect the project handover. This average satisfaction offers the room that participants can be better in collaborating for further improvement in project quality.

Table 7.1 Descriptive statistics of satisfaction with quality

n	mean	sd	median	min	max	se
199	3.72	0.68	4	2	5	0.05

Table 7.2 Frequency distribution of satisfaction with quality

		PP.Sat_qual			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	8	4.0	4.0	4.0
	3	57	28.6	28.6	32.7
	4	117	58.8	58.8	91.5
	5	17	8.5	8.5	100.0
	Total	199	100.0	100.0	

7.2.1.2 Time performance (TP)

The TP was also assessed by respondents who were asked to rate the level of client satisfaction with time (Table 7.3). Mean rating was found to be 3.38 with standard deviation of 1.0, and median ratings of 4.

Table 7.3 Descriptive statistics of satisfaction with time

n	mean	sd	median	min	max	se
199	3.38	1.01	4	1	5	0.07

It can be observed that 55.2% of clients were either satisfied or very satisfied with the time performance (Table 7.4). This argument is considerably lower than that with the quality performance. Indeed, 52.6 % respondents on late projects blamed financial supply, 35.5% also blamed contractors' performance, 34.2% blamed poor project management, and 26.3% blamed other problems as being responsible for the lost time.

Table 7.4 Frequency distribution of satisfaction with time

		PP.Sat_time			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	4.5	4.5	4.5
	2	33	16.6	16.6	21.1
	3	47	23.6	23.6	44.7
	4	93	46.7	46.7	91.5
	5	17	8.5	8.5	100.0
	Tota	199	100.0	100.0	

7.2.1.3 Cost performance (CP)

Respondents were also asked to indicate the level of client satisfaction with cost. Satisfaction was rated on a scale of 1 to 5, and descriptive statistics are shown in Table 7.5.

Table 7.5 Descriptive statistics of satisfaction with cost

n	mean	sd	median	min	max	se
199	3.39	0.81	3	1	5	0.06

As can be seen from Table 7.5, the mean rating is 3.39 with a standard deviation of 0.81. The median ratings are 3 implying satisfied clients on average. It can also be seen from the frequency table (Table 7.6) that on the projects covered by the sample, only 45.2% of clients were either satisfied or very satisfied with the cost outcomes whilst the remaining 54.8% were either indifferent about the cost outcomes or were dissatisfied.

Table 7.6 Frequency distribution of cost satisfaction measure

		PP.Sat_cost			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	1.5	1.5	1.5
	2	20	10.1	10.1	11.6
	3	86	43.2	43.2	54.8
	4	77	38.7	38.7	93.5
	5	13	6.5	6.5	100.0
	Tota	199	100.0	100.0	

It could be interpreted as meaning that many clients were not dissatisfied with cost outcomes because there were justifiable reasons for the cost overruns. Not surprisingly, 78.1 % of all respondents on over-budget projects blamed design variations (change orders), 56.1% also blamed cost estimation. This is consistent with the first survey (Chapter 1) which identified design variations as one of the main causes of budget overruns. 14% also attributed the overruns to poor project management, whilst 8.8% identified other factors as being responsible for the cost variation.

7.2.1.4 Safety and Environment performance (S&E P)

Table 7.7 Descriptive statistics of satisfaction with S&E

n	mean	sd	median	min	max	se
199	3.43	0.85	4	1	5	0.06

As can be seen from Table 7.7, the mean rating is 3.43 with a standard deviation of 0.85 and median ratings of 4 implying satisfied clients on average. It can also be seen from the frequency table (Table 7.8) that on the projects covered by the sample, 53.2% of clients were either satisfied or very satisfied with the S&E outcomes.

Table 7.8 Frequency distribution of S&E satisfaction measure

PP.Sat_S&E					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	2.5	2.5	2.5
	2	22	11.1	11.1	13.6
	3	66	33.2	33.2	46.7
	4	95	47.7	47.7	94.5
	5	11	5.5	5.5	100.0
	Tota	199	100.0	100.0	

7.2.1.5 Profitability performance (PP.Sat_Prof)

The mean level of satisfaction with project profitability was found to be 3.18 with standard deviation of 0.70 (Table 7.9). This implies that on average, participants were closely neither satisfied nor dissatisfied with profitability.

Table 7.9 Descriptive statistics of profitability satisfaction

n	mean	sd	median	min	max	se
199	3.18	0.70	3	1	5	0.05

As can be seen that only about 32.7% were satisfied or very satisfied with the level of profitability (Table 7.10)

Table 7.10 Frequency distribution of profitability measure

PP.Sat_Prof					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	1.5	1.5	1.5
	2	21	10.6	10.6	12.1
	3	110	55.3	55.3	67.3
	4	61	30.7	30.7	98.0
	5	4	2.0	2.0	100.0
	Tota	199	100.0	100.0	

In total, 5 measures of performance satisfaction (i.e., QP, TP, CP, S&E P, and PP) were specifically assessed. However, these five measures are constructed for the measurement of participant satisfaction (Par.S) which is commonly found in the literature on performance measures in construction management domain (Dozzi et al. 1996; Chan et al. 2002; Leung et al. 2004) and in some studies of culture (cf. Zuo and Zillante, 2006). Satisfaction is defined in Chan et al. (2002) as the level of 'happiness' of people affected by the project including key project participants. It is an attribute of success, which is both dependent on performance and personal standards or expectations (Liu and Walker, 1998; Cox et al., 2003). Satisfaction, described in Liu and Walker (1998) as an aptitude (an effect or emotion), is thus a subjective assessment of performance. Therefore, in this study the principal *participant satisfaction* measure encompasses the five sub-measurements (i.e., satisfaction of client on quality, time, cost, safety & environment, and contractor's profitability satisfaction).

This underlying measurement is also reinforced by using PCFA to which those five sub-measurements was extracted as significant factor. All variables on component one were positive indicating that they all vary together. As can be seen from Table 7.35, all the higher loadings relate to satisfaction. Indeed, all the other variables under this component are measures of satisfaction like client satisfaction with quality, cost, time, safety & environment, and contractor's satisfaction with profitability. This component was therefore labelled participant satisfaction. The positive associations between the satisfaction variables are a sign of the inter-relatedness of the satisfaction levels of project participants. There is support in the construction management literature for this assertion. Dozzi et al. (1996) for instance argued that if a project is profitable for the contractor, there is a greater chance of the client being satisfied.

Going by the evidence presented so far, it appears reasonable to suggest that participant satisfaction across the construction industry is generally high.

7.2.2 Productivity performance (Prod.P)

Respondents were asked to rate the overall level of labor productivity on a scale of 1 to 5. Mean rating was 3.27 with standard deviation of 0.76 and median ratings of 3 (Table 7.11), indicating a level of productivity overall on average.

Table 7.11 Descriptive statistics of productivity performance

n	mean	sd	median	min	max	se
199	3.27	0.76	3	1	5	0.05

What is interesting is that as many as 61.8% considered labor on their projects to be of average productivity, or even unproductive (Table 7.12).

Table 7.12 Frequency distribution of productivity measure

		Prod.P			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.5	.5	.5
	2	27	13.6	13.6	14.1
	3	95	47.7	47.7	61.8
	4	69	34.7	34.7	96.5
	5	7	3.5	3.5	100.0
	Tota	199	100.0	100.0	

7.2.3 Learning performance (Lea.P)

Respondents were asked to indicate the level of learning on this project relative to other projects they had been involved with. Their responses, summarized in the output below, appear to suggest that the level of learning on these projects was rather moderate (Table 7.13). Mean ratings for learning were 3.35 with standard deviations of 0.70 and median rating of 3.

Table 7.13 Descriptive statistics of learning performance

n	mean	sd	median	min	max	se
199	3.35	0.70	3	1	5	0.05

It was also noted that as many as 59.3% considered learning on their projects to be average, or even low (Table 7.14).

Table 7.14 Frequency distribution of learning measure

		Lea.P			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.5	.5	.5
	2	16	8.0	8.0	8.5
	3	101	50.8	50.8	59.3
	4	74	37.2	37.2	96.5
	5	7	3.5	3.5	100.0
	Tota	199	100.0	100.0	

7.2.4 Overall performance (Ovl.P)

Beside the three specific measures of performance, an overall project performance index was also suggested for measuring, which is similar to the works of Ogbonna and Harris (2000); Xiao (2002) and Lam et al. (2007). This overall project performance index brought together all three aspects of project performance in an attempt to give a holistic view of project performance based on a single aggregated performance indicator.

In this process of aggregation to form an overall performance index, equal weighting was applied to all the three performance measures (approximately 33.3% each). This is consistent with the argument that all aspects of performance need to be considered and the achievement of one aspect of performance should not be at the expense of another Xiao (2002). Moreover, Babbie (1990) has also indicated that unless there is a sound basis for differential weighting, equal weighting should be applied. Overall performance was thus taken as the summated mean and calculated as follows:

$$Ovl.P = \frac{1}{3} x\ (Par.S.P + Prod.P + Lea.P) \qquad (7.1)$$

Where:

Ovl.P is the abbreviation of overall performance
Par.S.P is the abbreviation of participant satisfaction
Prod.P is the abbreviation of productivity of labor
Lea.P is the abbreviation of learning from project

7.3 Analysis of variance (ANOVA)

As discussed, the contracting organizations in a construction project have different backgrounds and business objectives; thus, the perceived assessment on project outcomes may vary across contracting organizations. In this regard, an analysis of variance (ANOVA) was conducted to determine whether there is a significant difference in the perceived significance of the project outcomes evaluation between the two groups of respondents: clients and contractors. The results are summarized in Table 7.15. The ANOVA results of this study indicate that despite their association with different types of organizations, there is no evidence to suggest that respondents have different views regarding project performance in the construction industry.

Table 7.15 Kruskal-Wallis test results

	Statistics	Participant satisfaction (Par.S.P)	Labor productivity (Prod.P)	Learning (Lea.P)	Overall performance (Ovl.P)
Types of respondents	chi-squared	1.063	0.534	0.000	0.648
	p-value	0.303	0.817	0.999	0.421

Therefore, both groups of respondents agreed that the four performance indicators (i.e., Par.S.P, Prod.P, Lea.P, and Ovl.P) identified are valid measures of project performance in the construction industry. The acceptance of these indicators by the two groups of construction professionals suggests that the proposed framework can be appropriately used as a representative for project performance features in further investigations.

7.4 Summary

In order to provide a foundation for the inquiry of the influence of project organizational culture on project performance outcomes, an assessment of the performance of construction projects in the Vietnam was necessarily carried out. As such, a variety of performance measures, i.e., cost, time, quality, safety and environment, productivity, learning, and profitability outcomes were thus assessed in this chapter.

It is noted that the project performance levels found in this survey study were overall on average, offering the room that participants can be better in collaborating for improvement

the overall performance levels. As such, a further investigation of the participants' behavior during the course of project is needed in identifying orientations for the improvement.

Chapter 8 The influence of project organizational culture on project performance

This chapter addresses the main objective of this research, exploring the potential relationships between the project organizational culture and the project performance outcomes. A model of the relationships, which describes each cultural dimensions accounting for (represented by the relative importance index) explaining the variation in the corresponding performance, is developed and presented in this chapter to help identify best practice cultural orientations.

8.1 The procedures and statistical analysis

The main aim of this research is to establish empirically whether or not the project organizational has an impact on its performance, and to investigate the nature of any relationship(s) that exist. To help achieve this, a hypothesis was advanced in Chapter 4 as follows:

H1: Project organizational culture affects construction project performance.

This hypothesis can be interpreted that variations in the dimensions of project organization culture in relation to goal alignment and trust (C1), contractor commitment (C2), cooperative orientation (C3), empowerment commitment (C4), and worker orientation (C5) are expected to associate with differences in project performance outcomes. To test the hypothesis, data is thus statically examined to provide empirical evidence of significant associations between the dimensions of culture and the measures of performance.

To facilitate this analysis, correlation and multiple regression are statistical techniques to be employed as commonly in empirical culture research (Denison and Mishra, 1995; Cooke and Szumal, 2000; Ogbonna and Harris, 2000; Hofstede, 2001; Zoo and Zilante 2008).

8.1.1 Correlation

As in the last discussion, analysis of the correlations between the variables was applied to measure the strength of relationships between the cultural dimensions and the performance indicators. Designated r, *Pearson's product-moment correlation coefficient* was computed.

This statistic is appropriate when both variables are measured at an interval level or ratio-scaled (Lind et al. 2000; Trochim, 2006). The equation to compute the correlation coefficient, r, is given by Field (2000) as:

$$r = \frac{\sum_{i=1}^{n}(xi - \overline{x}).(yi - \overline{y})}{(n-1).Sx.Sy}$$

Where:

x and y are any pair of independent variables whose level of correlation is being sought

$\overline{x}$ and $\overline{y}$ are the means of x and y, respectively.

Sx and Sy are the standard deviations of x and y, respectively.

Correlation analysis is a very common statistical tool in culture in construction research. Some examples of research that have utilised this technique include Liu (1999), Cheung et al. (2003), Phua and Rowlinson (2004) and Chan and Chan (2005). This measure of association has also been noted as an important step towards the development of the regression model(s) (Hair et al., 1998).

8.1.2 Multiple regression

In essence, multiple regression is the origin of a regression model with the extension to multiple and/or vector-valued predictor variables. It is a method for studying the effects and the magnitude of the effects of more than one independent variable on one dependent variable using correlation and regression (Kerlinger and Lee, 2000). It leads to the derivation of an equation in which each independent (predictor) variable has its own coefficient and the dependent (outcome) variable is predicted from a combination of all the variables multiplied by their corresponding coefficients plus a residual term (Field, 2000). In general then, multiple regression procedures will estimate a linear equation of the form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \varepsilon_i$$

Where:

Y is the outcome variable

β_1 is the coefficient of the first predictor X_1

β_2 is the coefficient of the second predictor X_2

βn is the coefficient of the nth predictor X_n

ε_i is the difference between the predicted and observed value of Y for the i_{th} subject.

According to Hair et al. (1998), the coefficients are weights which effectively denote the relative contribution of the predictor variables to the overall prediction, and facilitate interpretation as to the influence of each variable in making the prediction. As aptly stated in Kerlinger and Lee (2000), the results of the calculations indicate how 'good' the prediction is and approximately how much of the variance of the outcome is explanted by the 'best' linear combination of the predictors. As such, the multiple regression model is appropriate in examining the influence of various dimensions of culture (independent variables) on each project performance outcome (dependent variable).

8.1.2.1 Methods of variable selection in multiple regression

There are several methods for deciding which independent variables to use in the regression model and how to enter these variables into the model. Three principal methods are identified as hierarchical, forced entry, and stepwise methods Field (2000), and another one is bayesian model averageing (Raftery et al. 1997; Hoeting et al, 1999).

Hierarchical regression relies on the identification of predictors based on past research. These known predictors are then entered into the regression model in order of their importance, after which the previously unidentified predictors are entered (Field, 2000). In this research, the absence of strong empirical evidence of important predictors from the literature on cultural orientations and performance precluded the use of this method of regression.

Forced entry requires all the predictors are simultaneously placed on the model. As noted in Field (2000), this method also relies on the existence of sound theoretical bases for inclusion of all the chosen variables. It is thus not appropriate to apply for this research.

The stepwise method is frequently used to decide which independent variables should be used in a regression model and how such variables should be incorporated into the model. Although the main value of stepwise selection is that it can be used to select a subset of explanatory variables based on statistical criteria, several recent studies have emphasized the limitations of stepwise selection, including the lack of stability of the set of selected variables and the bias in parameter estimates (Prost et al. 2008). This method also subsequently ignores both the variables that are not selected and the uncertainty caused by the variable selection procedure (Viallefont et al. 2001; Wang et al. 2004).

Bayesian model averaging (BMA) is thus applied in this study. The BMA approach selects a number of possible models and uses the posterior probabilities of these models to perform all inferences and predictions. The frequency of selection of the BMA is greater than that of stepwise selection. In many cases, BMA also provides smaller standard deviations for parameter estimates (Prost et al. 2008). The BMA method selects the correct model and outperforms the stepwise approach in predicting events of interest (Viallefont et al. 2001; Wang et al. 2004).

8.1.2.2 Assumptions of regression

The multiple regression procedure requires a number of key assumptions that are qualified. These assumptions must be met for the regression analysis to guarantee a model in which the actual errors in prediction are as a result of the real absence of a relationship among the variables and not caused by some characteristic of the data not accommodated by the regression procedure (Hairet al., 1998). These assumptions are given *ibid* as follows:

- Linearity
- Homoscedasticity
- Independence
- Normality

These assumptions are discussed in more detail as follows.

Linearity

Multiple linear regression needs the relationship between the independent and dependent variables to be linear. The linearity assumption can best be tested with scatter plots, and the data points should cluster around a straight line if the assumptions are met (Xiao, 2002). Linearity can also be assessed from an examination of residual plots which must show a random distribution of data points. Hair et al. (1998) and Field (2000) provide a number of residual plots which show non-linear patterns of residuals. Where such non-linear relationships exist, alternative regression methods such as the introduction of polynomial terms must be considered.

Homoscedasticity

Homoscedasticity describes a situation in which the error term (that is, the “noise” or random disturbance in the relationship between the independent variables and the dependent

variable) is the same across all values of the independent variables. Heteroscedasticity (the violation of homoscedasticity) is present when the size of the error term differs across values of an independent variable. The impact of violating the assumption of homoscedasticity is a matter of degree, increasing as heteroscedasticity increases.

Examining the scatterplot of the residuals against the predicted values of the dependent variable would show the classic cone-shaped pattern of heteroscedasticity. The shaped pattern in such a plot is evidence that the variance is constant or not (Hair et al., 1998). Alternatively, the Non-constant Variance Score Test for homogeneity of variance can be produced by R (the language and environment for statistical computing and graphics). Significant values indicate a departure from constant variance.

Independence

It is expected that the residual terms for any two cases should be uncorrelated (i.e. independent). Autocorrelation is said to exist where residual terms are not independent (Field, 2000). The test of autocorrelation can be done with the Durbin-Watson test. Durbin-Watson's d tests the null hypothesis that the residuals are not linearly auto-correlated. While d can assume values between 0 and 4, values around 2 indicate no autocorrelation. As a rule of thumb values of $1.5 < d < 2.5$ show that there is no auto-correlation in the multiple linear regression data.

Normality

A fundamental assumption of multiple regression, and what Hair et al. (1998) described as the most frequently violated assumption, is the assumption of normality of the predictor and outcome variables. This assumption can best be checked with a histogram of residuals and a fitted normal curve, which by visual inspection should be bell-shaped, approximating the normal distribution. Another tool is the use of the normal probability plot (a Q-Q-Plot) which compares the standardized residuals with a normal distribution which is represented by a straight diagonal line. If the distribution is normal, then the residual line must closely follow this diagonal line (Hair et al. 1998).

As indicated in Field (2000), it is only when all these assumptions are met that the model can be accurately applied to the population. All the assumptions were thus tested as each multiple regression model was generated.

8.2 The culture – performance correlation

The correlation between two variables was examined using bivariate correlation analysis. The Pearson's correlation coefficient is computed as a measure of linear association. This measure determines the strength and direction of the association between two variables which could be positively related, not related at all or negatively related (Field 2000).

From the Table 8.1, it could be observed that there is a positive correlation between dimensions of project organizational culture and the project performance (most of correlation coefficients above 0.4), which means that when one variable changes, the other variable also changes in accordance with it in a positive direction. This statistical revelation indicates that the project organizational culture could therefore be the key factor motivating participants to enhance productively the project outcomes.

Table 8.1 Correlation matrix of POC and project performance

		C1	C2	C3	C4	C5
Par.S.P	Pearson Correlation	.627**	.709**	.603**	.487**	.568**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	199	199	199	199	199
Prod.P	Pearson Correlation	.410**	.488**	.442**	.226**	.431**
	Sig. (2-tailed)	.000	.000	.000	.001	.000
	N	199	199	199	199	199
Lea.P	Pearson Correlation	.573**	.516**	.503**	.419**	.402**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	199	199	199	199	199
Ovl.P	Pearson Correlation	.640**	.717**	.618**	.494**	.580**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	199	199	199	199	199
***. Correlation is significant at the 0.01 level (2-tailed).*						

The relationships revealed in the correlation matrix do not confirm causality *per se* for reasons discussed in Field (2000) such as the third variable problem; they may be indicative of underlying causal relationships and as such require further exploration. However, this correlation confirms the existing of significant linear relationships to which one variable

changes, the other variable also changes in accordance with it in a positive or negative direction. It can therefore be inferred from the results that there is sufficient evidence of linear relationships to proceed with the regression modeling.

8.3 Modeling the influence of culture on performance

It has been noted in Field (2000) that whilst correlations are a useful research tool for examining the relationships between variables, they provide little information about the predictive power of the individual variables. Because regression modelling provides the means of assessing the predictive ability of individual variables as well as the goodness of fit of its combination, multiple regression was applied to the data to try and identify the cultural variables with the most predictive power for each measure of performance. The results are presented below.

8.3.1 Culture and participant satisfaction performance.

8.3.1.1 Regressions model

To identify significantly factors impact participant satisfaction performance, multiple regression analysis was conducted to the data with all five dimensions of culture included as predictors and participant satisfaction performance as the dependent variable. The Bayesian Model Averaging method of variable selection was used and output (in Table 8.2) was obtained. The result recommended the best model to which the three predictors selected. The selected model where Bayesian Information Criteria (BIC) and highest post probability (post prob) are -160.17924 (highest absolute value) and 0.491 (highest value) respectively, explaining 58.7% of the variation in the satisfaction of participant ($p<0.000$). The ANOVA which tests whether or not the model is a useful predictor of participant satisfaction gives a very highly significant result ($F = 92.45$, $p < 2.2e\text{-}16$), indicating that this model significantly improves the prediction of satisfaction of participant, and the variance inflation factor (VIF) analysis, as shown in Table 8.3, is well below 10 ((i.e., all VIFs were below 1.80), indicating no multicollinearity within the data (Field, 2000).

Table 8.2 The BMA of model selection for participant satisfaction

	p!=0	EV	SD	model 1	model 2	model 3	model 4
Intercept	100.0	0.636383	0.21623	0.63318**	0.60612**	0.57192**	0.93001***
C1	93.4	0.278559	0.11038	0.31359***	0.22921**	0.36720***	.
C2	100.0	0.379241	0.05412	0.36189***	0.39463***	0.41619***	0.43268***
C3	29.2	0.050648	0.09395	.	0.16472**	.	0.28295***
C4	10.3	0.007504	0.02874	.	.	.	.
C5	63.1	0.066533	0.05986	0.10936**	.	.	.
nVar				3	3	2	2
r2				0.587	0.582	0.570	0.567
BIC				-160.17924	-157.81687	-157.27552	-156.17760
post prob				0.491	0.151	0.115	0.066

Table 8.3 Regression analysis results for participant satisfaction

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)		VIF
(Intercept)	0.63318	0.20160	3.141	0.00195	**	
C1	0.31359	0.06793	4.616	7.08e-06	***	1.658
C2	0.36189	0.04934	7.334	5.83e-12	***	1.798
C5	0.10936	0.03819	2.863	0.00465	**	1.607

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.39 on 195 degrees of freedom

Multiple R-squared: 0.5872, Adjusted R-squared: 0.5808

Table 8.4 ANOVA test results for participant satisfaction

```
Response: Par.Sat

            Df  Sum Sq Mean Sq  F value    Pr(>F)

C1           1 28.2454 28.2454 185.6765 < 2.2e-16 ***

C2           1 12.6985 12.6985  83.4757 < 2.2e-16 ***

C5           1  1.2473  1.2473   8.1992  0.004649 **

Residuals 195 29.6637  0.1521

F-statistic: 92.45 on 3 and 195 DF,  p-value: < 2.2e-16

---

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The multiple regression analysis revealed that three predictors of Goal alignment & trust (C1), Contractor commitment (C2), and Worker orientation (C5) positively relate to participant satisfaction. It could be implied that the projects with higher the levels of these predictors are also the ones with the higher levels of participant satisfaction; while, the variables of cooperative orientation (C3) and Empowerment commitment (C4) do not.

Table 8.3 also provides the actual parameters of the regression model. From this table, the final regression equation for participant satisfaction can be presented as:

Participant satisfaction = 0.633 + 0.314 (Goal alignment and trust) +0.362 (Contractor commitment) + 0.109 (Worker orientation).

8.3.1.2 Testing the assumptions of regression

Analyses of residuals are widely used to test the assumptions of the regression. Plots of the residuals are shown in Figures 8.1, 8.2, 8.3 and 8.4.

The histogram shows a bell-shaped distribution (Fig. 8.2) indicating that the assumption of normality has not been violated. In addition, the normal probability plot of expected cumulative probability against observed cumulative probability also displays points generally lying close to the straight line indicating that the residuals are approximately normally distributed, which helps to reinforce the conclusions drawn from the histogram.

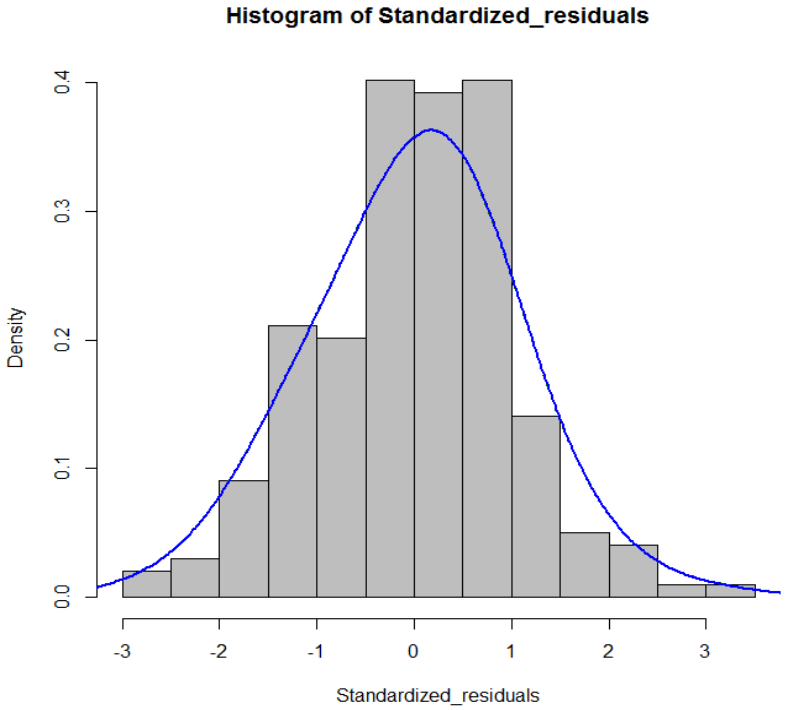


Figure 8.1 Standardized residuals

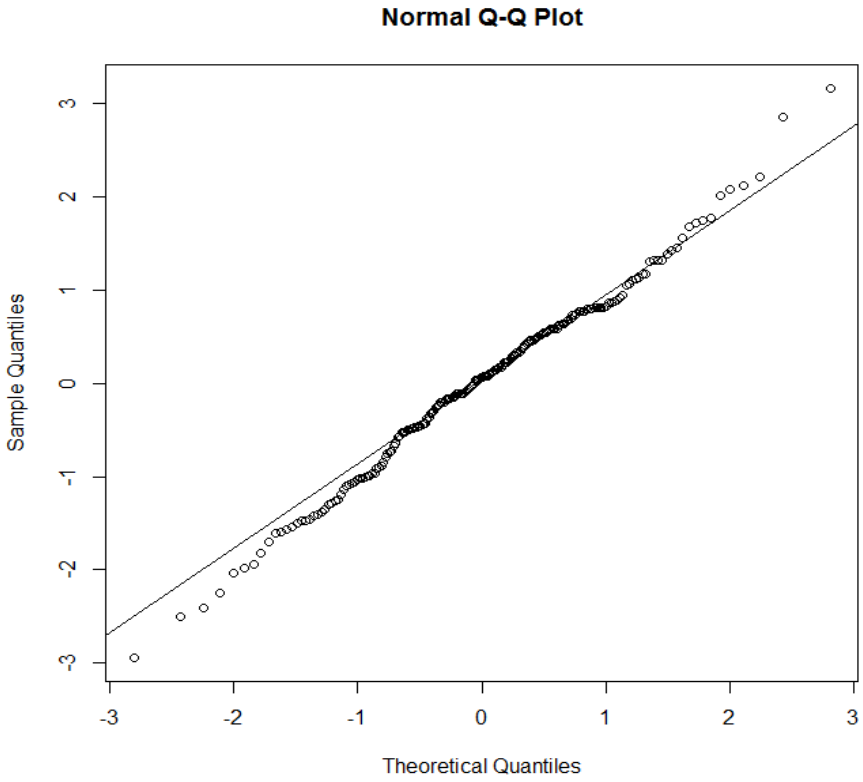


Figure 8.2 Normal Q-Q Plot of regression standardized residual of participant satisfaction model

To test for the homogeneity, the Non-constant Variance Score Test (NVST) was obtained (Table 8.5). Its significant value of 0.036 is higher than threshold of 0.05, indicating that this assumption has also not been violated. In addition, this assumption can be checked by visual examination of the plot of the standardized residuals (the errors) versus predicted value (Fig. 8.3). It can be observed that residuals are randomly scattered around 0 (the horizontal line), so assuming that the error terms have a mean of zero is reasonable. The vertical width of the scatter doesn't appear to increase or decrease across the fitted values, so we can assume that the variance in the error terms is constant.

Table 8.5 Results of NVST for participant satisfaction model

Non-constant Variance Score Test
Variance formula: ~ fitted.values
Chisquare = 4.373572 Df = 1 p = 0.0365004

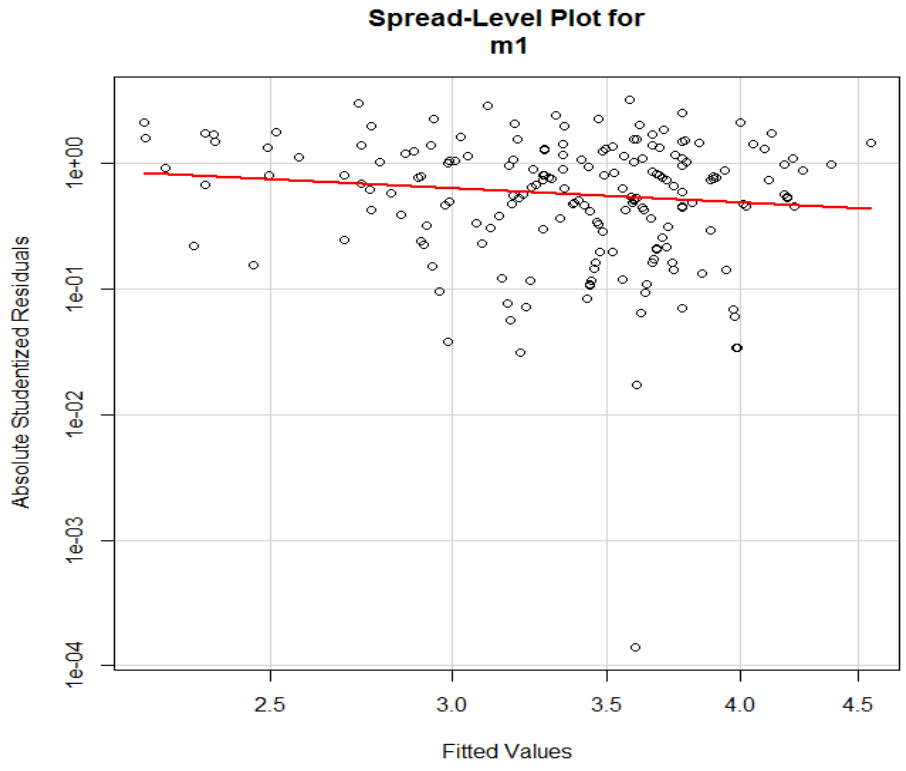


Figure 8.3 Plot of the standardized residuals (the errors) versus fitted value

To test for the linearity, this assumption can be checked by visual examination of the Component-plus-residual (partial residual) plots (Fig. 8.4). As seen that, there is no evidence

of none-linear relationships between three cultural dimensions of C1, C2, and C5 and project performance of participant satisfaction (Par.S.P).

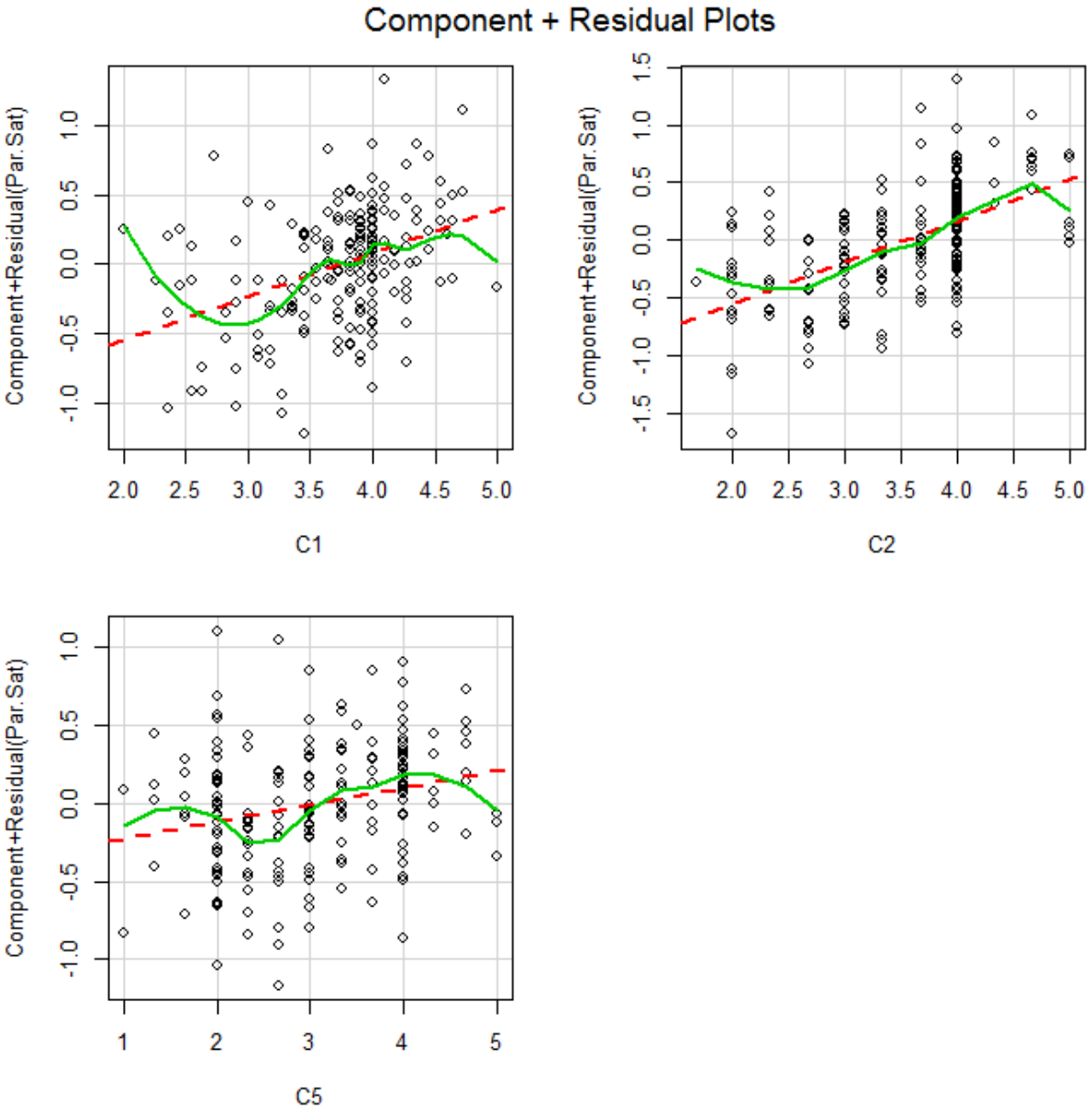


Figure 8.4 Component plus Residual Plot for participant satisfaction model

To test for the independence, the Durbin-Watson test was obtained (Table 8.6). The results noted than the D-W statistic value of 2.053 is very close to 2 and P-value of 0.72 is higher than threshold of 0.05, indicating that this assumption has also not been violated.

Table 8.6 Results of Durbin-Watson test for participant satisfaction model

lag	Autocorrelation	D-W Statistic	p-value
1	-0.03702478	2.053787	0.72

Alternative hypothesis: rho != 0

In summary, results of testing for assumptions indicate that the regression model produced is a goodness-of-fit model for the data and can be applied to the population.

8.3.2 Culture and productivity performance

8.3.2.1 Regression model

In order to identify significantly factors predict for productivity performance, multiple regression analysis was again conducted to the data with all five dimensions of culture included as predictors and productivity performance as the dependent variable. The Bayesian Model Averaging method of variable selection was also applied and output (in Table 8.7) was obtained. The result recommended the best model to which the two predictors selected. The selected model where Bayesian Information Criteria (BIC) and highest post probability (post prob) are -55.0401 (highest absolute value) and 0.475 (highest value) respectively, explaining 28.1% of the variation in the productivity performance ($p<0.000$). The ANOVA which tests whether or not the model is a useful predictor of productivity performance gives a very highly significant result ($F = 38.29$, $p < 9.208e\text{-}15$), indicating that this model significantly improves the prediction of productivity, and the variance inflation factor (VIF) analysis, as shown in Table 8.8, is well below 10 ((i.e., all VIFs were below 1.50), indicating no multicollinearity within the data (Field, 2000).

Table 8.7 Output of BMA for productivity performance

	p!=0	EV	SD	model 1	model 2
Intercept	100.0	1.12841	0.30765	1.0443***	1.4358***
C1	11.5	0.01949	0.07427	.	.
C2	100.0	0.35011	0.07690	0.3530***	0.3611***
C3	77.5	0.22328	0.14902	0.2889***	.
C4	15.9	-0.02293	0.06342	.	.
C5	33.5	0.04995	0.08251	.	0.1851**
nVar				2	2
r2				0.281	0.272
BIC				-55.0401	-52.6879
post prob				0.475	0.146

Table 8.8 Regression analysis results for productivity performance

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)		VIF
(Intercept)	1.04429	0.26345	3.964	0.000103	***	
C2	0.35305	0.07296	4.839	2.64e-06	***	1.438
C3	0.28885	0.08472	3.409	0.000790	***	1.438

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.6449 on 196 degrees of freedom

Multiple R-squared: 0.2809, Adjusted R-squared: 0.2736

Table 8.9 ANOVA test results for productivity performance

```
Response: Lab_prod

            Df Sum Sq Mean Sq F value    Pr(>F)

C2           1 27.007 27.0074  64.946 7.413e-14 ***

C3           1  4.834  4.8339  11.624 0.0007902 ***

Residuals 196 81.505  0.4158

F-statistic: 38.29 on 2 and 196 DF,  p-value: 9.208e-15

---

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The multiple regression analysis revealed that two predictors of Contractor commitment (C2) and Cooperative orientation (C3) positively relate to labor productivity. It could be implied that the projects with higher the levels of these predictors are also the ones with the higher levels of labor productivity; while, the variables of Goal alignment and trust (C1), Empowerment commitment (C4), and Worker orientation (C5) do not.

Table 8.8 also provides the actual parameters of the regression model. From this table, the final regression equation for productivity performance can be presented as:

Labor productivity = 1.044 + 0.353 (contractor commitment) +0.288 (cooperative orientation)

8.3.2.2 Testing the assumptions of regression

Analyses of residuals are also used to test the assumptions of the regression. Plots of the residuals are shown in Figures 8.5, 8.6, 8.7 and 8.8.

The histogram shows a bell-shaped distribution (Fig. 8.5) indicating that the assumption of normality has not been violated. In addition, the normal probability plot (Fig. 8.6) of expected cumulative probability against observed cumulative probability also displays points

generally lying close to the straight line indicating that the residuals are approximately normally distributed, which helps to reinforce the conclusions drawn from the histogram.

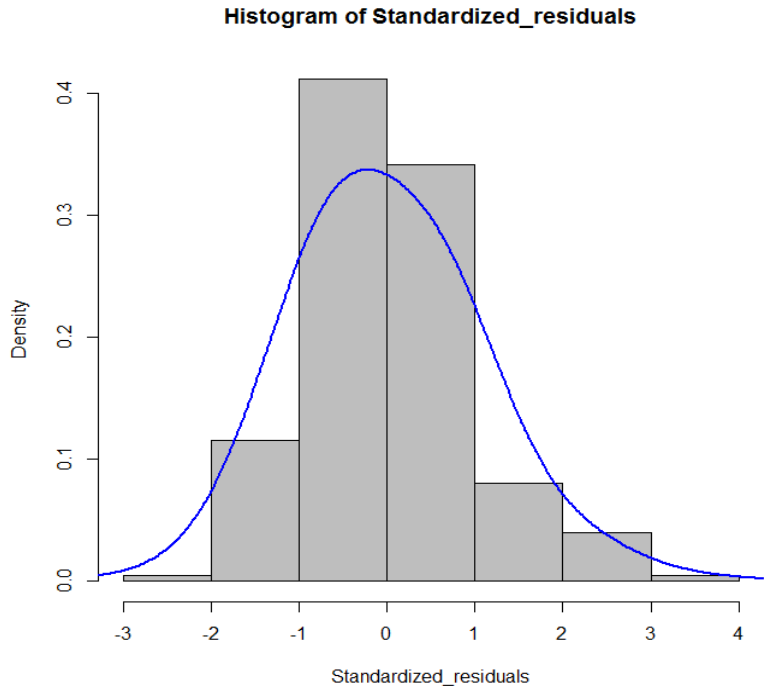


Figure 8.5 Standardized residuals

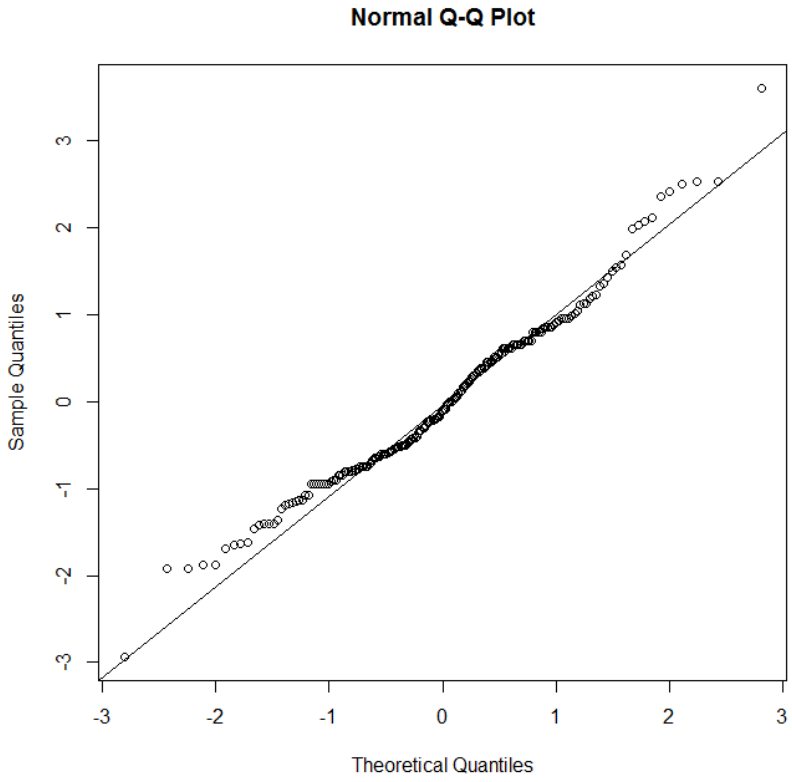


Figure 8.6 Normal Q-Q Plot of standardized residual of productivity performance model

To test for the homogeneity, the Non-constant Variance Score Test (NVST) was obtained (Table 8.10). Its significant value of 0.0027 is lower than threshold of 0.05, indicating that this assumption has appeared to be violated. However, this assumption can be also checked by visual examination of the plot of the standardized residuals (the errors) versus predicted value (Fig. 8.7). It was noted that residuals are randomly scattered around 0 (the horizontal line), so assuming that the error terms have a mean of zero is relatively reasonable. The vertical width of the scatter doesn't appear too much increase or decrease across the fitted values, so we can assume that the variance in the error terms is fairly constant.

Table 8.10 Results of NVST for productivity performance model

```
Non-constant Variance Score Test

Variance formula: ~ fitted.values

Chisquare = 8.964113    Df = 1     p = 0.002753344
```

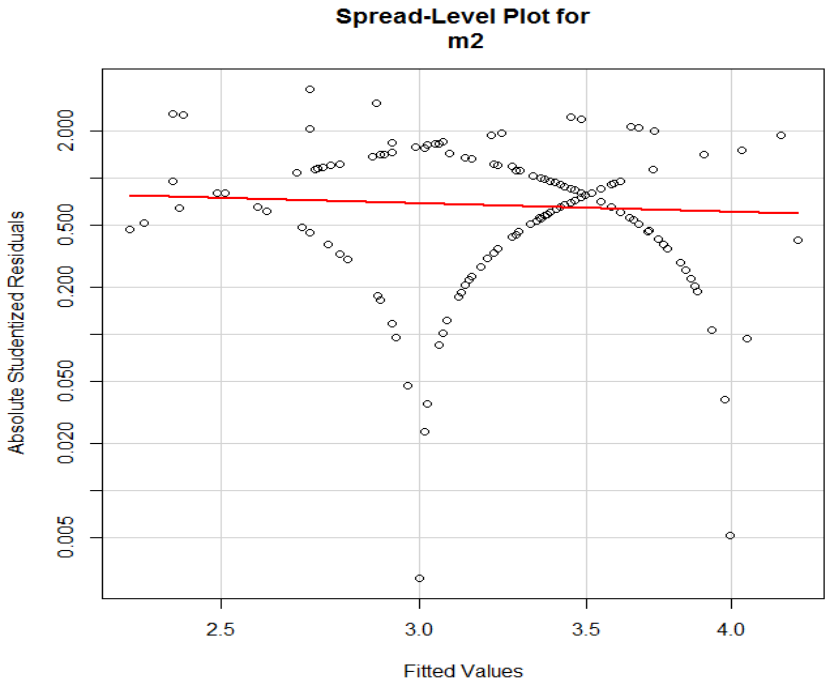


Figure 8.7 Plot of the standardized residuals (the errors) versus fitted value

To test for the linearity, this assumption can be checked by visual examination of the Component-plus-residual (partial residual) plots (Fig. 8.8). As seen that, there is no evidence

of none-linear relationships between two cultural dimensions of C2 and C3 and project performance of labor productivity (Lab_prod).

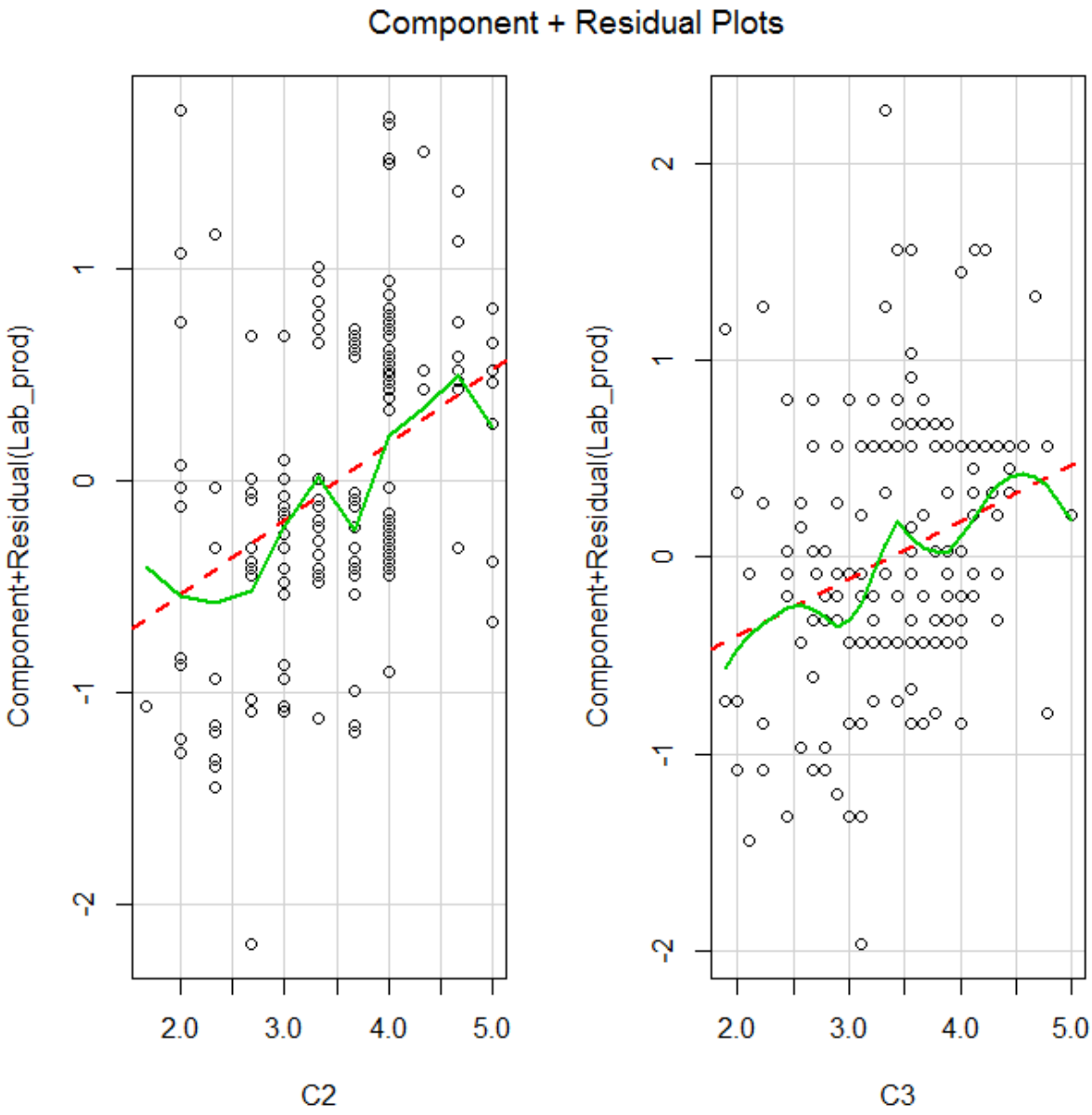


Figure 8.8 Component plus Residual Plot for productivity performance model

To test for the independence, the Durbin-Watson test was obtained (Table 8.11). The results noted than the D-W statistic value of 1.826 is very close to 2 and P-value of 0.232 is higher than threshold of 0.05, indicating that this assumption has also not been violated.

Table 8.11 Results of Durbin-Watson test for productivity model

```
 lag Autocorrelation D-W Statistic p-value

   1      0.08224094       1.82657   0.232

 Alternative hypothesis: rho != 0
```

In summary, results of testing for assumptions indicate that the regression model produced is a goodness-of-fit model for the data and can be applied to the population.

8.3.3 Culture and Learning performance

8.3.3.1 Regression model

To identify significantly factors impact participant learning performance, multiple regression analysis was conducted to the data with all five dimensions of culture included as predictors and learning performance as the dependent variable. The Bayesian Model Averaging method of variable selection was used and output (in Table 8.12) was obtained. The result recommended the best model to which the two predictors selected. The one nominated model where Bayesian Information Criteria (BIC) and post probability (post prob) are -83.549 and 0.744, respectively, explaining 37.7% of the variation in the learning performance ($p<0.000$). The ANOVA which tests whether or not the model is a useful predictor of learning performance gives a very highly significant result ($F = 92.45$, $p < 2.2e\text{-}16$), indicating that this model significantly improves the prediction of learning, and the variance inflation factor (VIF) analysis, as shown in Table 8.13, is well below 10 ((i.e., all VIFs were below 1.80), indicating no multicollinearity within the data (Field, 2000).

Table 8.12 Output of BMA for learning performance

	p!=0	EV	SD	model 1
Intercept	100.0	0.391265	0.28666	0.39143
C1	100.0	0.536250	0.10157	0.55049***
C2	100.0	0.250342	0.06582	0.25376***
C3	9.0	0.008894	0.04058	.
C4	9.8	0.008282	0.03472	.
C5	6.8	0.002675	0.01735	.
nVar				2
r2				0.377
BIC				-83.54999
post prob				0.744

Table 8.13 Regression analysis results for learning performance

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)		VIF
(Intercept)	0.39143	0.28596	1.369	0.17263		
C1	0.55049	0.09315	5.909	1.5e-08	***	1.532
C2	0.25376	0.06498	3.905	0.00013	***	1.532

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5564 on 196 degrees of freedom

Multiple R-squared: 0.3769, Adjusted R-squared: 0.3705

Table 8.14 ANOVA test results for learning performance

```
Response: Learn

            Df Sum Sq Mean Sq F value    Pr(>F)

C1           1 31.980  31.980 103.305 < 2.2e-16 ***

C2           1  4.721   4.721  15.249 0.0001296 ***

Residuals 196 60.676   0.310

F-statistic: 59.28 on 2 and 196 DF,  p-value: < 2.2e-16

---

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The multiple regression analysis revealed that two predictors of Goal alignment & turst (C1) and Contractor commitment (C2) positively relate to learning performance. It could be implied that the projects with higher the levels of these predictors are also the ones with the higher levels of learning performance; while, the variables of Cooperative orientation (C3) and Empowerment commitment (C4), Worker orientation (C5) do not.

Table 8.14 also provides the actual parameters of the regression model. From this table, the final regression equation for learning performance can be presented as:

Learning performance = 0.391 + 0.550 (Goal alignment and trust) +0.253 (Contractor commitment)

8.3.3.2 Testing the assumptions of regression

Analyses of residuals are widely used to test the assumptions of the regression. Plots of the residuals are shown in Figures 8.9, 8.10, 8.11 and 8.12.

The histogram shows a bell-shaped distribution (Fig. 8.9) indicating that the assumption of normality has not been violated. In addition, the normal probability plot of expected cumulative probability against observed cumulative probability also displays points generally lying close to the straight line indicating that the residuals are approximately normally distributed, which helps to reinforce the conclusions drawn from the histogram.

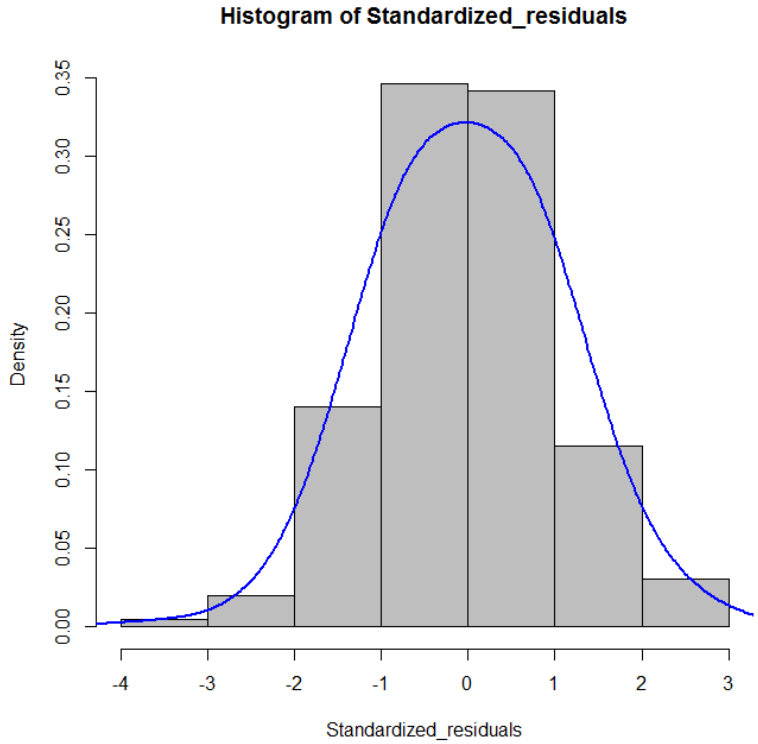


Figure 8.9 Standardized residuals

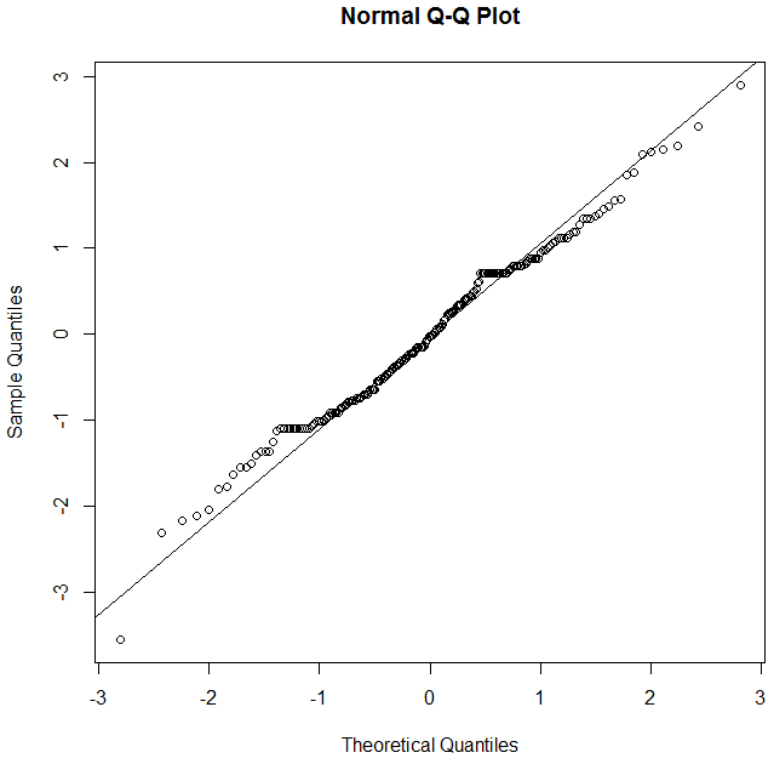


Figure 8.10 Normal Q-Q Plot of regression standardized residual of learning performance model

To test for the homogeneity, the Non-constant Variance Score Test (NVST) was obtained (Table 8.15). Its significant value of 0.879 is higher than threshold of 0.05, indicating that this assumption has also not been violated. In addition, this assumption can be checked by visual examination of the plot of the standardized residuals (the errors) versus predicted value (Fig. 8.11). It can be observed that residuals are randomly scattered around 0 (the horizontal line), so assuming that the error terms have a mean of zero is reasonable. The vertical width of the scatter doesn't appear to increase or decrease across the fitted values, so we can assume that the variance in the error terms is constant.

Table 8.15 Results of NVST for learning performance model

```
Non-constant Variance Score Test

Variance formula: ~ fitted.values
```

```
Chisquare = 0.02312974    Df = 1     p = 0.8791202
```

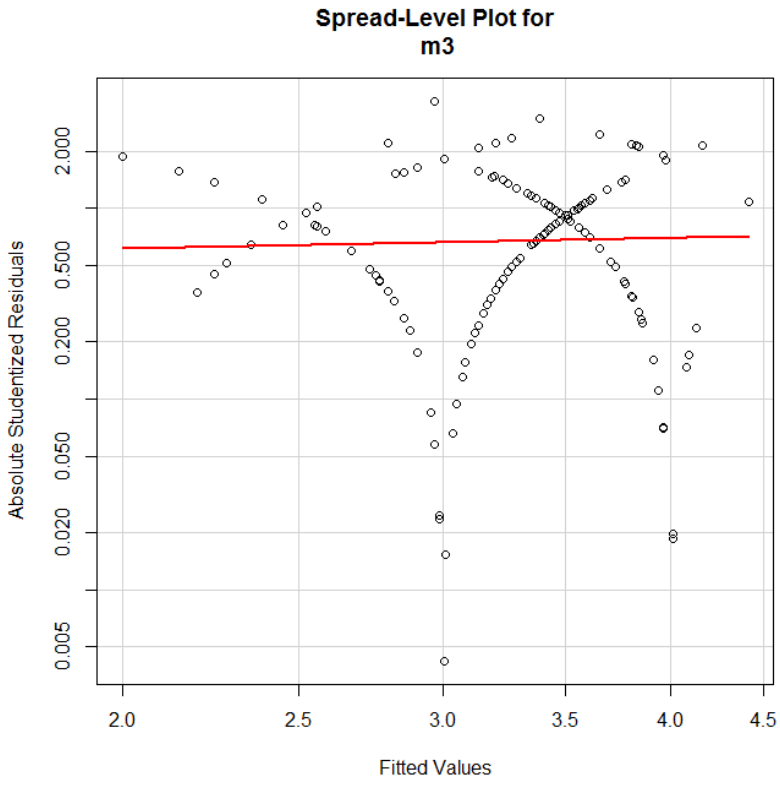


Figure 8.11 Plot of the standardized residuals (the errors) versus fitted value

To test for the linearity, this assumption can be checked by visual examination of the Component-plus-residual (partial residual) plots (Fig. 8.12). As seen that, there is no evidence of none-linear relationships between two cultural dimensions of C1 and C2 and project performance of learning (Learn.).

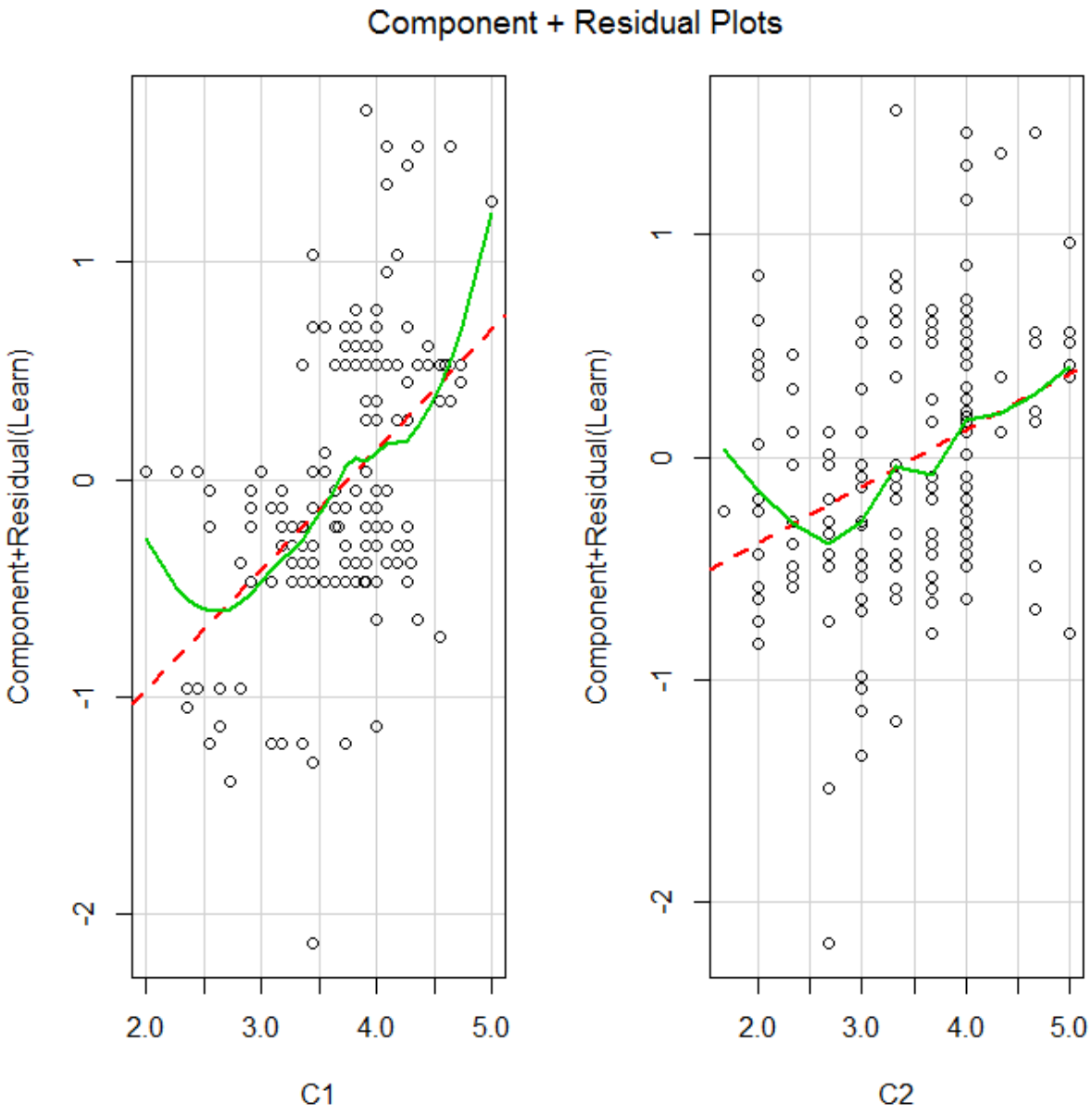


Figure 8.12 Component plus Residual Plot for learning performance model

To test for the independence, the Durbin-Watson test was obtained (Table 8.16). The results noted than the D-W statistic value of 1.925 is very close to 2 and P-value of 0.562 is higher than threshold of 0.05, indicating that this assumption has also not been violated.

Table 8.16 Results of Durbin-Watson test for learning performance model

```
 lag Autocorrelation D-W Statistic p-value

   1      0.02484606      1.925049   0.562

 Alternative hypothesis: rho != 0
```

In summary, results of testing for assumptions indicate that the regression model produced is a goodness-of-fit model for the data and can be applied to the population.

8.3.4 Culture and Overall performance

8.3.4.1 Regressions model

To identify significantly factors impact Overall performance, multiple regression analysis was conducted to the data with all five dimensions of culture included as predictors and overall performance as the dependent variable. The Bayesian Model Averaging method of variable selection was used and output (in Table 8.17) was obtained. The result recommended the best model to which the three predictors selected. The selected model where Bayesian Information Criteria (BIC) and highest post probability (post prob) are -189.261 (highest absolute value) and 0.556 (highest value) respectively, explaining 64.3% of the variation in the overall performance ($p<0.000$). The ANOVA which tests whether or not the model is a useful predictor of overall performance gives a very highly significant result ($F = 117.2$, $p < 2.2e-16$), indicating that this model significantly improves the prediction of overall performance, and the variance inflation factor (VIF) analysis, as shown in Table 8.18, is well below 10 ((i.e., all VIFs were below 1.80), indicating no multicollinearity within the data (Field, 2000).

Table 8.17 The BMA of model selection for overall performance

	p!=0	EV	SD	model 1	model 2	model 3
Intercept	100.0	0.64830	0.17405	0.65592***	0.63199***	0.59686***
C1	100.0	0.30024	0.07760	0.32789***	0.23784**	0.37958***
C2	100.0	0.34353	0.04457	0.33491***	0.36512***	0.38727***
C3	34.8	0.04979	0.07947	.	0.16920**	.
C4	5.0	0.00160	0.01269	.	.	.
C5	74.7	0.07461	0.05311	0.10545**	.	.
nVar				3	3	2
r2				0.643	0.640	0.624
BIC				-189.26126	-187.29054	-184.27497
post prob				0.556	0.207	0.046

Table 8.18 Regression analysis results for overall performance

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)		VIF
(Intercept)	0.65592	0.17314	3.788	0.000202	***	
C1	0.32789	0.05834	5.620	6.53e-08	***	1.658
C2	0.33491	0.04238	7.903	1.96e-13	***	1.798
C5	0.10545	0.03280	3.215	0.001528	**	1.607

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.335 on 195 degrees of freedom

Multiple R-squared: 0.6433, Adjusted R-squared: 0.6378

Table 8.19 ANOVA test results for overall performance

```
Response: Ovl.P

            Df  Sum Sq Mean Sq F value    Pr(>F)

C1           1 27.3061 27.3061 243.351 < 2.2e-16 ***

C2           1 10.9948 10.9948  97.986 < 2.2e-16 ***

C5           1  1.1596  1.1596  10.335  0.001528 **

Residuals 195 21.8807  0.1122

F-statistic: 117.2 on 3 and 195 DF,  p-value: < 2.2e-16

---

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The multiple regression analysis revealed that three predictors of Goal alignment & trust (C1), Contractor commitment (C2), and Worker orientation (C5) positively relate to overall performance. It could be implied that the projects with higher the levels of these predictors are also the ones with the higher levels of overall performance; while, the variables of Cooperative orientation (C3) and Empowerment commitment (C4) do not.

Table 8.3 also provides the actual parameters of the regression model. From this table, the final regression equation for overall performance can be presented as:

Overall performance = 0.655 + 0.327 (Goal alignment and trust) +0.334 (Contractor commitment) + 0.105 (Worker orientation).

8.3.4.2 Testing the assumptions of regression

Analyses of residuals are widely used to test the assumptions of the regression. Plots of the residuals are shown in Figures 8.13, 8.14, 8.15 and 8.16.

The histogram shows a bell-shaped distribution (Fig. 8.13) indicating that the assumption of normality has not been violated. In addition, the normal probability plot of expected cumulative probability against observed cumulative probability also displays points generally lying close to the straight line indicating that the residuals are approximately normally distributed, which helps to reinforce the conclusions drawn from the histogram.

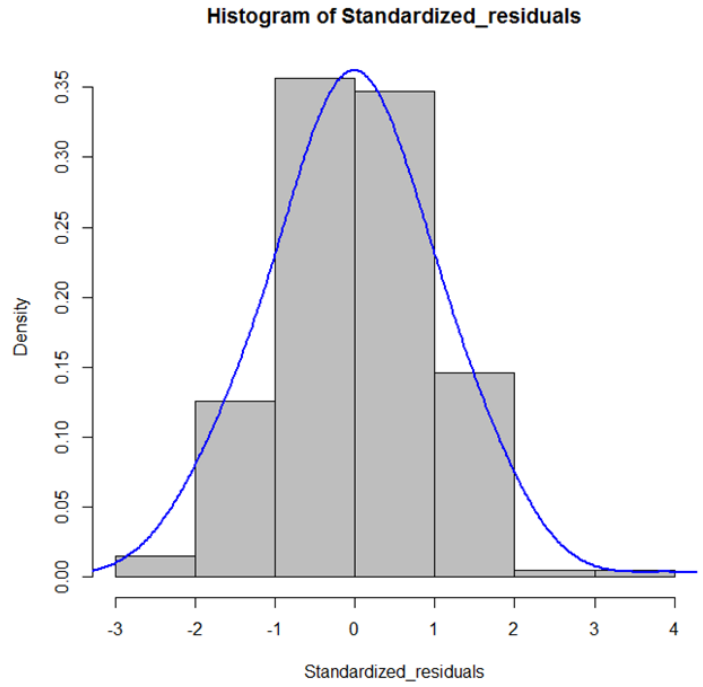


Figure 8.13 Standardized residuals

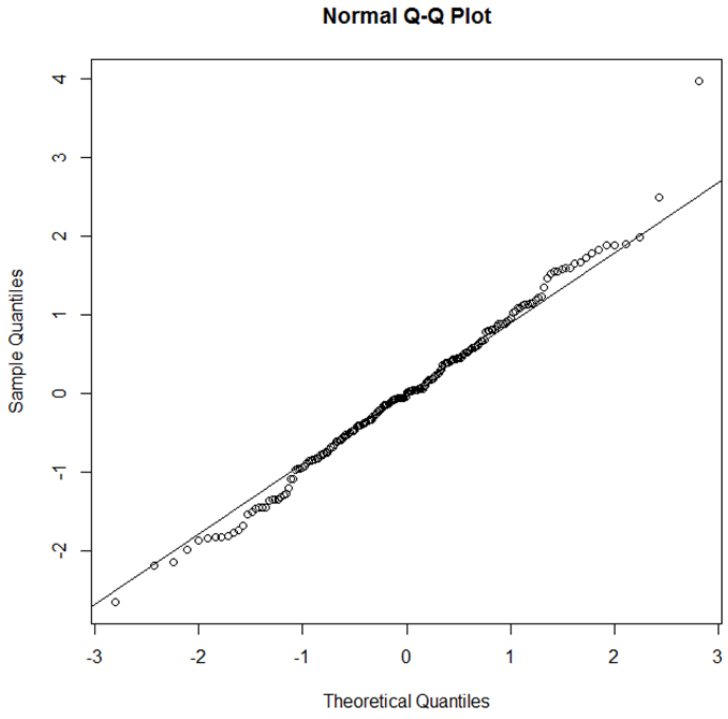


Figure 8.14 Normal Q-Q Plot of regression standardized residual of overall performance model

To test for the homogeneity, the Non-constant Variance Score Test (NVST) was obtained (Table 8.20). Its significant value of 0.0514 is higher than threshold of 0.05, indicating that

this assumption has also not been violated. In addition, this assumption can be checked by visual examination of the plot of the standardized residuals (the errors) versus predicted value (Fig. 8.15). It can be observed that residuals are randomly scattered around 0 (the horizontal line), so assuming that the error terms have a mean of zero is reasonable. The vertical width of the scatter doesn't appear to increase or decrease across the fitted values, so we can assume that the variance in the error terms is constant.

Table 8.20 Results of NVST for overall performance model

```
Non-constant Variance Score Test

Variance formula: ~ fitted.values
```

```
Chisquare = 3.792275    Df = 1      p = 0.05148963
```

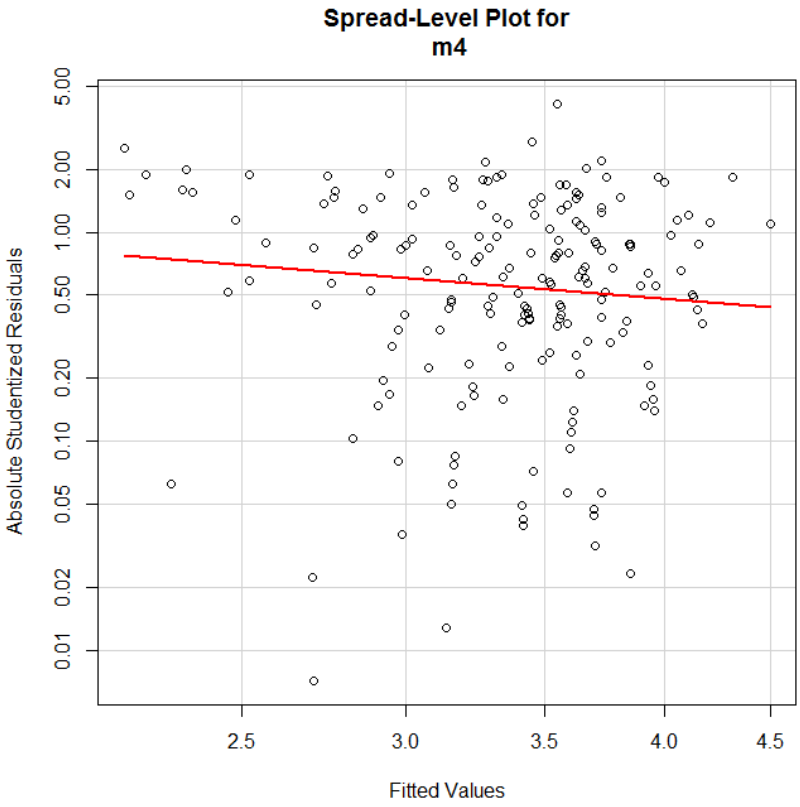


Figure 8.15 Plot of the standardized residuals (the errors) versus fitted value

To test for the linearity, this assumption can be checked by visual examination of the Component-plus-residual (partial residual) plots (Fig. 8.16). As seen that, there is no evidence

of none-linear relationships between three cultural dimensions of C1, C2, and C5 and project performance of overall performance (Ovl.P).

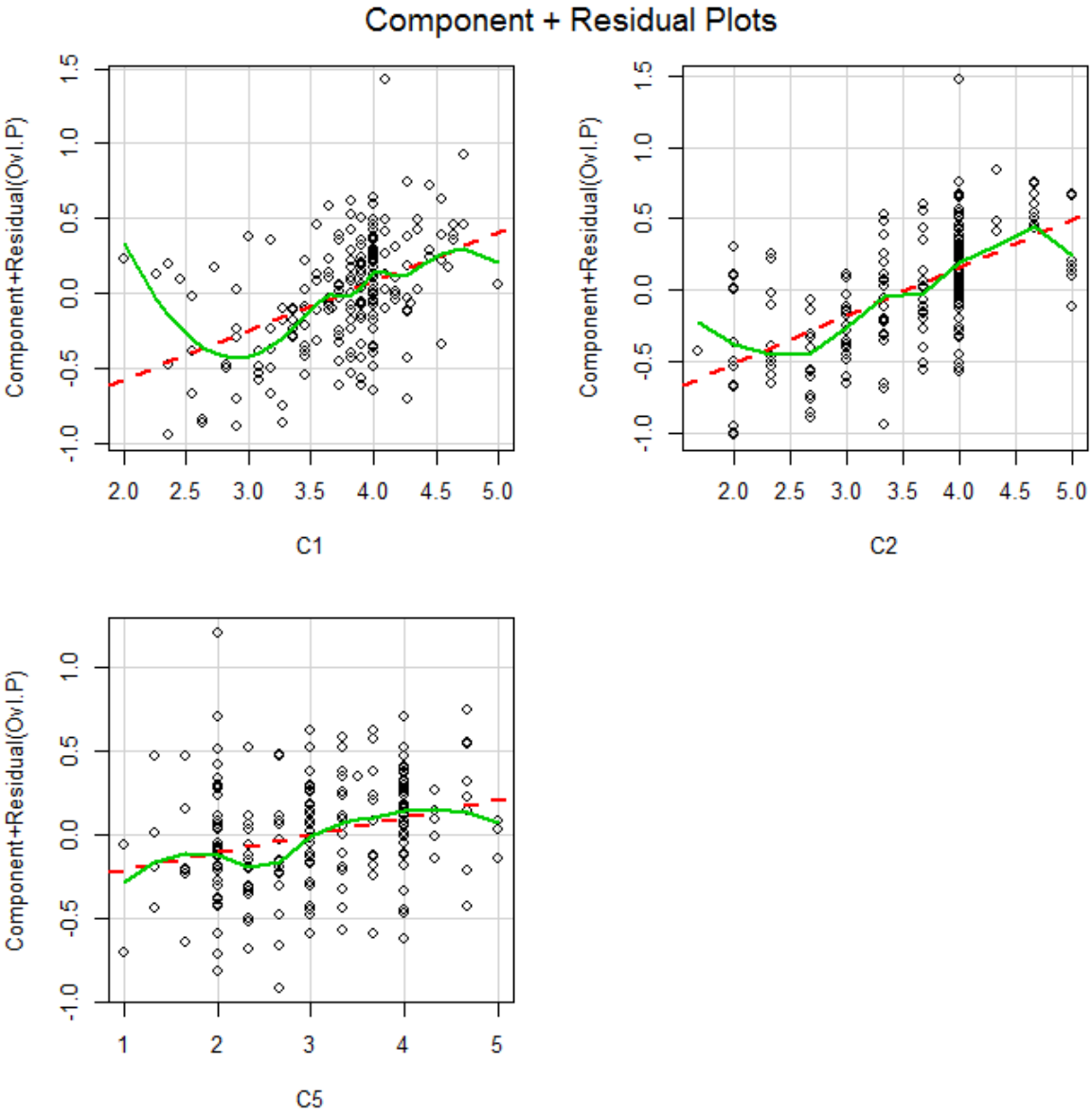


Figure 8.16 Component plus Residual Plot for overall performance model

To test for the independence, the Durbin-Watson test was obtained (Table 8.21). The results noted than the D-W statistic value of 2.016 is very close to 2 and P-value of 0.9 is higher than threshold of 0.05, indicating that this assumption has also not been violated.

Table 8.21 Results of Durbin-Watson test for participant satisfaction model

```
 lag Autocorrelation D-W Statistic p-value

   1     -0.01881157      2.016694     0.9

  Alternative hypothesis: rho != 0
```

In summary, results of testing for assumptions indicate that the regression model produced is a goodness-of-fit model for the data and can be applied to the population.

8.4 Discussion

The main objective of this study was to examine empirically the extent to which the project organizational culture influences on project performance. As discussed in Chapter 2 and Chapter 3, although culture is recognized as a significant factor influencing on performance (Mullins 1993; Dozzi et al. 1996; Fenn et al. 1997; Chua et al. 1999; Cooper 2000; Phua and Rowlinson 2003), many of those claims are subjectively or arbitrarily (as argued in *ibid*). Going beyond these gaps, this research has exposed empirical evidence that there is existing associations between cultural orientation and performance outcomes.

The links found between cultural orientation and project performance outcomes are captured in Figure 8.17, which shows the overall model based on the aggregation of the regression models for the different performance measures. This model shows in a simple fashion the nature of the relationships between the dimensions of culture and the performance measures and the significances by which each dimensions account for (represented by the relative importance index, Table 8.22) explaining the variation in the corresponding performance.

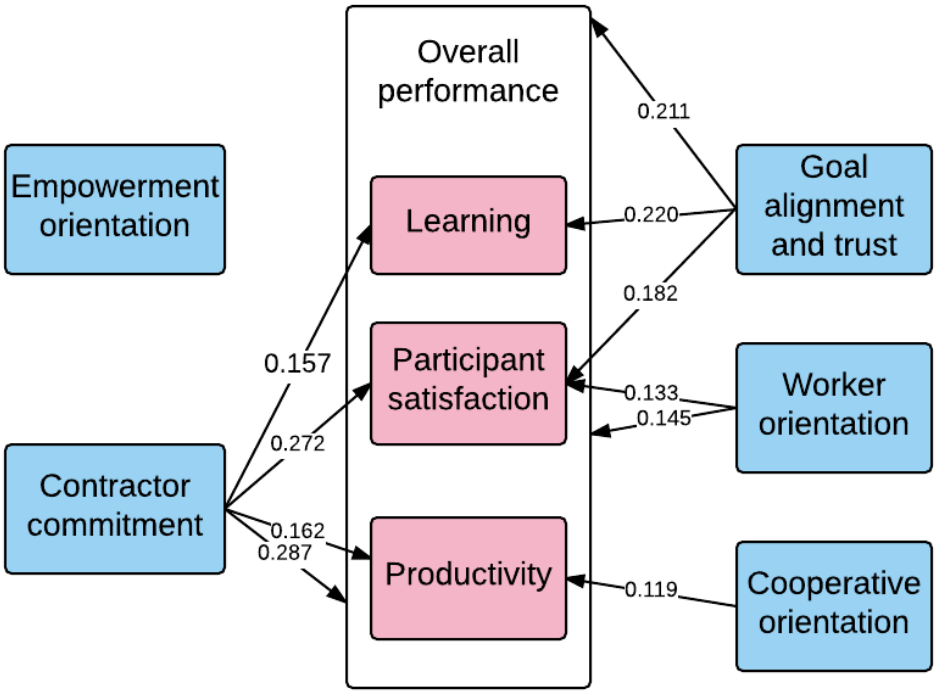


Figure 8.17 associations between POC and project performance

These relationships are determined in regression models which are indicated with relatively large coefficient of determination (R^2) values ranging from 28% to 64 % (as synthesized in Table 8.22). This relatively high R^2 values reinforce the significance of relationship revealed by the models; in comparing with models with similar R^2 values that were found in the research literature (cf. Leung et al. 2004; Omoregie, 2006). Omoregie (2006), for instance, reported R^2 values ranging from 4% to 26%.

To summarize from the findings note that three predictors—goal alignment and trust (C1), contractor commitment (C2), and worker orientation (C5)—positively relate to both overall outcome and participant satisfaction, which may indicate that projects with higher levels of these predictors also have higher levels of participant satisfaction and overall performance. These findings do not support those of Zuo et al. (2008), who found that a cooperative culture correlates with overall project performance. It may be that cooperative culture is an efficient dynamic for the partnership approach that was the focus in their study. However, if we consider the content of related factors, these results are reasonable. In contributing to participant satisfaction as well as to the overall outcome with the primary project objectives (i.e., satisfaction with quality, cost, time, safety, and profit), the commitment of project members, objective understanding, the clarification of roles and responsibilities, the mutual trust of participants, and worker orientation are essential areas. These primary project

performance criteria can be satisfied only through a process with clear objectives, role and responsibility sharing, strong commitment, and employee orientation through which project members know when and what they have to do, who can support their work and who is fully committed to the joint efforts. As such, a project team can also accessibly acquire the knowledge necessary to perform an activity or solve a problem, which is crucial to the future success of the project (Todorović et al. 2015).

The cultural dimension is the worker orientation which is reported to significantly play in enhancing project performance. This revelation is consistent with Liu (1999) and Zuo and Zillante (2006) finding, confirming the importance of workforce orientation. Workforce orientation, generally speaking, is not an area for which the Vietnamese construction industry is renowned for exemplifying good practice. Improvements in regard of these aspects are therefore called for.

It is also noted that a cooperative orientation contributes to enhancing labor productivity. This revelation is expected in the field of human resource management, where a cooperation environment is expected to create effective working relationships, openness and mutual respect, and exchanges of ideas and support, which are the main factors that positively influence workforce performance. In addition, the results of our study were unrelated to the variables included in the empowerment orientation factor (C4). In general, the redundancy of empowerment orientation is somewhat surprising because this orientation promotes leadership culture (Fetterman, 2015), which is recognized in the project management literature (Bryde, 2005; Christenson and Walker, 2004). This redundancy may be explained by the fact that an empowerment culture is inefficient when applied in a price-based (i.e., low-bid or traditional procurement) environment with a client who assumes a great deal of power in managing the project (Kashiwagi et al., 2012).

To assess the relative importance of regressors in the linear models, the quantification of the contribution of individual regressors to a multiple regression model is indicated. Each regressor's contribution is the R^2 from the univariate regression, and all univariate R^2 values add up to the total model R^2 (Gromping 2006). The functionality of the R package ("relaimpo") has been employed to assess the relative importance of linear models by offering a metric of LMG (R-squared partitioned by averaging over orders, as in Lindemann, Merenda and Gold). The results are presented in Table 8.22.

Table 8.22 Relative importance metrics

Variables	Participant satisfaction	Labor productivity	Learning	Overall performance
Goal alignment and trust (C1)	0.182	.	0.220	0.211
Contractor commitment (C2)	0.272	0.162	0.157	0.287
Cooperative orientation (C3)	.	0.119	.	.
Empowerment commitment (C4)	.	.	.	.
Worker orientation (C5)	0.133	.	.	0.145
R-squared	0.587	0.281	0.377	0.643

Figure 8.17 and table 8.22 show that contractor commitment (C2) plays the most vital role in most project outcomes even though this finding seems to be different from the perception of practitioners that client was perceived as the most influential of all the project participants (refer to Table 6.2). Nevertheless, the significant role of the contractor is consistent with the suggestion that the contractor has a significant influence on performance outcomes (Dozzi et al. 1996; Chua et al. 1999). This revelation could also explain the significant impact of the contractor on the success of projects in the traditional procurement approach known as the low-bid system. This system is plagued by major issues, including project delays, budget overruns, and poor customer satisfaction (Nguyen and Watanabe 2014); poor productivity (Latham 1994; Egan 1998); poor safety and insufficient quality (Gardenas and Ashley 1992); and low contractor profit margins (Drew 2011; Kashiwagi et al. 2012). The present study indicates that participants' commitment to the course of a project could be the key factor in project success in the traditional procurement environment. To our knowledge, this is the first study to investigate the influence of project organizational culture on project outcomes in a context dominated by traditional procurement-driven projects.

In summary, the five-factor project organizational culture framework obtained in this study may be regarded as more practice-specific than frameworks that have previously been reported in construction-related studies in terms of application. In addition, the five-factor framework is clearly recognized by Denison's model (2000), which has been widely utilized for its explanatory value with respect to business organizations. Denison (2000) states that an

effective organization should include the four organizational culture traits of involvement, consistency, adaptability and mission; these traits are believed to influence the performance of business organizations. These concepts can be related to the findings of this study as follows. Project organizational culture with the dimension of goal alignment can be linked to mission, vision and strategy and can provide everyone with a clear direction for their work during the course of a project. The dimension of cooperative orientation is amplified by a coordination and integration culture within which different functions and units of a project's organization can and do work together well; moreover, project members should understand the mutual impacts of the ways that they work and ensure that work is coordinated and integrated to serve the project organization as a whole and achieve common goals. This approach helps to engender internal consistency. Denison (2000) argues that organizations with clear missions that emphasize internal consistency are stable. In addition, the dimension of contractor commitment reflects a customer-focused culture within which it is believed that the contractor recognizes the need to react to and serve the client and continually seeks to meet the client's future needs and improve ways to satisfy client expectations. This culture orientation contributes to enabling the project organization to perceive and respond to the environment and the customer (i.e., the client) in a manner that allows the project organization to adapt appropriately. Moreover, the dimension of empowerment culture provides opportunities to individuals who have the authority, initiative, and ability to manage their own work. Furthermore, individuals attain greater clarity regarding areas in which they have decision-making power, input, or no responsibilities. This phenomenon creates a sense of ownership and responsibility toward the project organization. An emphasis on worker orientation reflects the culture of capability development within which the project organization is thought to continually invest in the development of employee skills to remain competitive and meet on-going business needs. Empowerment and capability development in combination with team orientation have been argued to foster high involvement among project members (Denison, 2000).

What can be proposed on the basis of the findings reported is that contractor commitment, goal alignment and trust, cooperative orientation, and worker orientation have important roles to play in determining project outcomes. It is reasonably suggested for further conducting more critical and in-depth investigation into these dimensions of culture. Best practice cultural orientations in respect of these dimensions of culture can therefore be suggested as:

- A greater goal alignment and trust-concentrating on a greater amount of effort in motivating objective understanding, roles and duties of participants, mutual understanding and trust, information sharing. It is also important of encouragement given by project manager, consideration of people's contributions, and available opportunities for people.
- A greater contractor commitment- including a greater level of contractor commitment to quality, to schedule, to budget.
- A greater cooperative orientation- encompassing a greater effort in motivating looking forward to project benefits, effective working relationships, openness and mutual respect, exchanges of ideas and support, accountability and assignment of blame, recognition of achievements, client commitment to agreements, leaders' instruction, and involvement in decision making.
- A greater worker orientation- including a greater effort in paying attention with training sessions, respect for workers, concern for workers.

These practice cultural orientations are in line with Belout (1998) and Nicolini (2002) who supported that effectiveness of the project could be achieved based on devoting a significant amount of skill, knowledge and attention to human resource. The practical pointers include training in project management, employee support, commitment of project team, job description clearness, clear mission, clarity of roles and responsibilities, communication, co-location, appropriate team selection and composition (Belout 1998; Nicolini 2002). The evidence of cultural change in enhancing project performance provides justification for devoting more effort, adequate resources, and attention towards improving these orientations. These issues appear to be driven by participants' motivation of towards achieving the project objectives. Motivated persons are the key to obtain the organization's goals (Beilout 1998; Robbins and Judge 2013).

Considered together, these findings provide sound empirical evidence for accepting the main research hypothesis which posited that project organizational culture positively affects construction project performance. Clearly, the cultural orientation as assessed through the dimensions of contractor commitment, goal alignment and trust, cooperative orientation, and worker orientation significantly influence construction project performance. The statistics confirm that these associations are not just due to chance but are real. The amount of variation in performance outcomes that culture accounts for is relatively high judging from

the R^2 values; it is significant enough to warrant greater attention from both the academia and construction industry practitioners.

It has been argued that the Project Managers play the vital role in warranting the development of the optimum project organizational culture (Riley and Clare Brown, 2001; Anderson, 2003). Through the identification of best practices, the direction to an optimum project organizational culture can be achieved. This does not however mean to the conclusion of any one best cultural model. As noted, there is a need for congruence between the culture and its context (Thompson, 1993; Kotter and Heskett, 1992), implying that the orientations may vary from context to context. What is important is to be aware of the potential adverse impacts on outcomes so that steps can be taken to mitigate these effects.

8.5 Summary

This chapter focused on exploring the potential influences of the project organizational culture on project performance. Pearson's correlation coefficients and multiple regression were employed for this purpose. As a result, the main objective of this research was addressed and the model that relates organizational culture with performance was developed. The findings note that three predictors—goal alignment and trust, contractor commitment, and worker orientation —positively relate to both overall outcome and participant satisfaction, which may indicate that projects with higher levels of these predictors also have higher levels of participant satisfaction and overall performance. It is also noted that cooperative orientation contributes to enhancing labor productivity; while, the results of our study were unrelated to the variables included in the empowerment commitment factor. The finding also demonstrates that contractor commitment plays the most vital role in most project outcomes.

Chapter 9 Research validation

In the previous chapters, hypotheses of this study have been examined through investigating the data collected, capturing in the development of models for predicting the performance outcomes. This results support for the identification of the cultures that are best suited to the peculiar nature and needs of the construction industry that can enhance the industry performance. At the same time, the relevant questions are made for the research claims (i.e., inferences, interpretations, and conclusions). What is the logical argument? What is the empirical evidence? How do we know if claims are warranted? To answer these questions, this chapter is thus devoted to the process of validation to confirm (or disconfirm) the findings of the research.

9.1 Validity and the Research process

Validity is the most significant consideration in test evaluation (Wainer and Braun 2009). Particularly, as for social science research, Drost (2011) emphasized that the essential part of such research is the quantification of human behavior — that is, using measurement instruments to observe human behavior. The measurement of human behavior belongs to the widely accepted positivist view, or empirical analytic approach, to discern reality. Since this paradigm is taken place by most behavioral research, measurement instruments must be valid.

Validation is the process of evaluating the logical arguments and scientific evidence that support claims (Taylor 2013). In conducting the behavior measurements, researcher are concerned with whether they are measuring what they intended to measure. Threats to validity are those factors that lead us to doubt whether research and assessment claims can be trusted. These threats might derive from a myriad of sources. Generally, validation requires questioning the validity of claims in four areas: internal validity, external validity, statistical conclusion validity, and construct validity (Campbell & Stanley, 1966; Cook & Campbell, 1979, 1983; Cronbach & Meehl, 1955; Kane, 2006; Messick, 1989; Parker, 1993; Shadish, Cook & Campbell, 2002; Drost, 2011; Taylor, 2013). In research, internal validation asks whether the results of the investigation are truly due to expected causal relationships among variables. External validation asks whether the results of the investigation can be generalized beyond the specific situation of study conducted. Statistical conclusion validity requires whether statistical conclusions can be trusted. Finally, construct validity asks whether the

connection between assessment results and the construct that is intended to measure. The objective of this chapter is to discuss insight into each type validity of this research claims.

9.2 Internal validation

The internal validity is the degree to which the research claims are supported by which the research results are attributable to the expected relationships among the identified variables in the investigations (Rosenthal and Rosnow 1991; Drost 2011; Taylor 2013). Researchers are supposed to use both logical arguments and empirical evidence for the validity process.

Threats to internal validity compromise the confidence in confirming that a relationship exists between the independent and dependent variables. Collective threats to internal validity of research claims can be defined into following four main categories (Drost 2011; Taylor 2013): person factors (e.g., bias in selection, maturation, mortality, interactions with selection); measurement or statistical factors (e.g., pre-testing, instrumentation, statistical regression, ambiguity of results); situational factors (e.g., history, low reliability of treatment implementation, random irrelevancies in the treatment situation, diffusion or imitation of the treatment, and equalization of treatment); and alternate statistical models (e.g., alternative models that explain the relationships among the variables in the theory).

Each design of quantitative researches (i.e., experimental or quasi-experimental research, and correlational research) has attempted to manage potential internal threats to validity. The good research design is thus important for achieving good internal validity. This study is conducted as correlational research that involves employing statistical processes (i.e., multiple regression) to look for explanatory patterns and trends in data, building models to explain the cultural influences on project performance. As such, the correlational designs of this study for addressing internal threats to the validity of research claims are focally considered.

Correlational methods are used to explain variability in scores (i.e., differences among research participants) on one or more dependent variables (e.g., level of project performance). This makes them ideal for investigating possible threats to the validity of causal claims. According to Taylor (2013), there are four correlational methods including: multiple-regression, path analysis, hierarchical linear modeling, and structural equation modeling. This study used multiple-regression to investigate which variables (i.e., five dimensions of project organizational culture) are the best predictors of project performance. Specifically, this study

results note that three predictors including goal alignment and trust, contractor commitment, and worker orientation are positively relate to both overall outcome and participant satisfaction. In addition, the use of regression (i.e., by offering a metric of LMG (R-squared partitioned by averaging over orders, as in Lindemann, Merenda and Gold)) allows the authors to determine the relative strength of each variable in explaining project performance scores. In this way, the analysis results (Table 8.22) suggest that contractor commitment plays the most vital role in most project outcomes. The next strongest predictor is goal alignment and trust, followed by worker orientation.

To investigate alternative models those explain the relationships among the variables in the theory. The BMA approach is applied is this study. This approach allows selecting a number of possible models and uses the posterior probabilities of these models to perform all inferences and predictions. As such, the correct or parsimonious model is proposed, which the Bayesian information criteria (BIC) and the post-probability (post prob) methods have the highest absolute value and highest value, respectively.

9.3 Construct validity

Construct validity refers to how well you translated or transformed a concept, idea, or behavior – that is a construct – into a functioning and operating reality, the operationalization (Trochim, 2006). As such, construct validity defines how well a test or experiment measures up to its claims. It refers to whether the operational definitions of a variable actually reflect the true theoretical meaning of a concept. To substantiate construct validity involves accumulating evidence in six validity types: face validity, content validity, concurrent and predictive validity, and convergent and discriminant validity.

Construct validity is a device used almost exclusively in social sciences, psychology and education. Construct validity is valuable in social sciences, where there is a lot of subjectivity to concepts. For major and extensive research, *especially* in education and language studies, most researchers test the construct validity before the main research. These pilot studies establish the strength of their research and allow them to make any adjustments.

In this study, the pilot stages were implemented as abovementioned in the previous chapters. The preliminary interviews were conducted with 21 practitioners who worked as in the primary role of project manager or senior engineer. The respondents were asked to explore reasonable cultural artifacts based on their own experiences with industry difficulties

(Table 6.10) and to propose suitable performance indicators for an industry survey (Table 4.1). The interviews were conducted face-to-face in a semi-structured manner. The primary questions were asked, and then additional questions were added as warranted. The next piloting stage, a tentative questionnaire model was distributed to those participants who were first required scanning the items to ensure the clarity of instructions and reasonable contents of questions. The questionnaire was then modified in order to generate the most precise answers

In addition, a whole battery of statistical tools and coefficients are used to prove strong construct validity. Specifically, Principal Component factor Analysis (PCA) with varimax rotation was conducted to validate the underlying structure of the project organizational culture dimensions (Mir and Pinnington 2014). The PCFA is an effective tool for demonstrating convergent and discriminant validity and to reduce the number of variables to be considered in subsequent analyses. Furthermore, the reliability of the data was verified for the factorized artifacts using Cronbach's alpha by which the statistical analysis suggested that all factors have acceptable internal consistency reliability (Cserháti and Szabó 2014).

9.4 Validity of statistical conclusions

Statistical conclusions are claims made based on the strength of statistical results. When thinking about the validity of statistical conclusions, we are applying the principles of relativism described in Chapter 1. The goal is to falsify the null hypothesis or test competing explanations for phenomena. This study is a correlational research using multiple-regression, threats to the validity of statistical conclusions are thus considered including: statistical significance, effect size, violating the assumptions of statistical tests.

Statistical significance

The term statistical significance is used to describe a situation in which a statistical test suggests nontrivial relationships among the variables in the data. The researcher hopes that this nontrivial difference supports his or her theory. Specifically, this study conducted the statistical test the differences as follows: (1) the chi-square ($\chi 2$) test was conducted on these procurement types to test the null hypothesis that they are equally distributed in the population. The output shown clearly that the differences suggested are highly significant and not due to chance ($\chi 2 = 371.225$, df = 4, p-value < 2.2e-16). This implies that there is very strong evidence to show that the traditional procurement approach is still the most popular

among others. (2) The chi-square ($\chi 2$) test was conducted on these bid types to test the null hypothesis that they are equally distributed in the population. The output presents that the differences suggested are highly significant and not due to chance ($\chi 2$ = 75.8477, df = 2, p-value < 2.2e-16). This implies that there is very strong evidence to show that the Competition approach is still the most popular among others. (3) By using of the Kruskal_Wallis method and the Kruskal_Wallis post hoc analysis, the results indicated that there is a significant difference in the *no bidding intervention criterion* (Bid_intl2) between the Competition and Limited method ($p < 0.05$). The level of the bid intervention of the Limited route is significantly higher (mean = 2.56) than that of the Competition route (mean = 3.19).

Effect size

One way that researchers deal with the meaning of a statistical result is to examine effect size. Effect size is a measure of the strength of a statistical relationship; the greater the effect size, the greater the support for the validity of causal claims.

In correlational research, a Pearson correlation (r) is considered a measure of effect size. For correlations (r), Cohen's (1992) levels 2 were r ≅0.10 (small effect), r ≅ 0.30 (medium effect), and r ≅ 0.50 (large effect). In a regression analysis, R2 (the squared correlation) is a measure of effect size. R2 is an estimate of the variance of one variable explained by or shared with another variable. Using Cohen's criteria, it follows that 1 percent of variance (R2 = 0.01) is a small effect, 9 percent of variance (R2 = 0.09) is a medium effect, and 25 percent of variance (R2 = 0.25) is a large effect.

Violating the assumptions of statistical test

The assumptions of statistical tests are violated when the data to be analyzed are not consistent with basic assumptions for a specific statistical test. Researchers have to investigate whether parametric tests are robust to various violations to these assumptions. In this research, all assumptions of each statistical models (i.e., linearity, homoscedasticity, independence, normality) are tested and they are not violated (refer to chapter 8).

9.5 External validation

The external validity of claims ensures the research robustness and is the degree to which findings of a single study can be and generalized beyond the specific investigation (Reason and Rowan, 1981; Rosenthal and Rosnow, 1991; Fellows and Liu, 1997; Drost 2011; Taylor

2013). There are two main aspects of research to support external validity: replication and sample size.

9.5.1 Replication

Replication ensures the set of findings can be reproduced when the same pathway (experimental, theoretical or empirical) and the same set of instruments, research design, and research strategy are used again (Brinberg and McGrath, 1985; Rosenthal and Rosnow, 1991). In other words to what extent would the same findings occur if the study is repeated with no factors varied? When studies are replicated in multiple settings with different samples of participants and at different times, the results are more trustworthy

Other sources describe this as the test of reliability of the research (cf. Rosenthal and Rosnow, 1991; Hairet al., 1998; Kerlinger and Lee, 2000). In reality, it is not possible to have an exact replication given that no two occasions are ever the same (Brinberg and McGrath, 1985; Rosenthal and Rosnow, 1991). For this research in particular, it was also unrealistic to expect that the same findings would be reproduced from the questionnaire survey. It is however demonstrated that the logistical research design was developed with the main instrument of questionnaire (Appendix C). The development of questionnaire was grounded in both theoretical knowledge and practices of the construction industry. This instrument was also piloted before officially conducting that ensures the reliability of the data collected.

9.5.2 Sample size

A second way to strengthen the generalizability of causal claims is through the use of large sample sizes involving cases from multiple sites. Large samples can compensate, to a certain extent, for the lack of experimental controls in correlation research. Rather than accounting for all possible confounding variables in the research design, unaccounted-for variables are allowed to function randomly across individuals and settings. If targeted causal relationships are strong enough to emerge from the overall complexity of the study, large samples strengthen the generalizability causal claims. Large samples derived from multiple contexts randomly distribute many of the confounding variables that could threaten generalizability, thereby making the causal claims more generalizable.

Whilst it was not a deliberate intention in this research to follow this trend, it was not possible to progress to the large sample purely due to the constraints (such as the time and cost constraints associated with completing a PhD) associated with undertaking this research.

It is however recognized that there are some potential sample sizes to the findings reported in this research, i.e., which is the geographic survey that cover across country (i.e., the North, the Middle, and the South); 199 respondents is not comparative small sample. Indeed, these potential sample sizes represent potential areas for further study.

In summary, although some of the sources of potential invalidity in measurement and manipulation of variables were successfully reduced during the course of the research (Brinberg and McGrath 1985), it can be concluded from these results that generally the findings of the main survey are an accurate reflection of the situation within the construction industry, and to that extent, generalizations can be made for construction projects across Vietnam.

9.6 Summary

This chapter provided evidences for the research validation though analyzing four main aspects of validation (i.e., internal validation, construct validation, validity of statistical conclusions, and external validation). It is noted that the findings of the validity process confirm the claims of this research.

Chapter 10 Conclusion and Recommendations

This research undertakes an investigation the impacts of project organizational culture on project performance by using data collected from completed projects in Vietnam. This chapter summarizes the main findings and limitations of the research. Also, some recommendations are provided to further researches.

10.1 Conclusion of the research

The main conclusions of the research are as follows:

1. It is recognized a project organizational culture (POC) framework including five principal dimension, namely Goal alignment and trust (C1), Contractor commitment (C2), Cooperative orientation (C3), Empowerment commitment (C4), and Worker orientation (C5).
2. The findings show that dimensions of project organizational culture do not vary across the characteristics of project in regard to project participants, project size, type of project fund, procurement approach, and bid method. However, it is demonstrated that the dimension of worker orientation is significant different in project type with regard to transport infrastructures and buildings. The study also reveals that the bid evaluation principles in respect fair and transparent competition, no intervention of bid process, trust on past performance of bidder, reasonable capability of contractor on site were positively correlated with project culture.
3. Most of dimensions of culture assessed are significant in terms of their association with the performance measures, and there is significant evidence and support for the position that cultural orientation (along certain specific dimensions of culture) has an impact on project performance outcomes. The findings reveal that goal alignment and trust, contractor commitment, and worker orientation contribute to better overall performance and participant satisfaction. Labor productivity can be predicted using only two cultural dimensions: contractor commitment and cooperative orientation. Goal alignment and trust and contractor commitment are more useful in predicting learning performance. The study also demonstrates that contractor commitment plays the most important role in project outcomes. The significant associations found

provide empirical support for the main research hypothesis H1 which posits that project organizational culture positively affects construction project performance.

In summary, there is justification for the calls for cultural change in the project organization. Research into project performance must therefore also consider this aspect in order to evolve comprehensive frameworks for performance improvement.

10.2 Research contributions

This investigation is the first study to provide insight into the definition and identification of organizational culture at the project level from a work practice-based perspective that reflects the shared knowledge and competence of a project organization during the course of a project. In addition, this study provides empirical evidence of significant associations between project organizational culture and construction project performance that may be indicative of a causal effect of culture. It contributes to validating a theory of organizational behavior by suggesting that people's behaviors affect organizational performance, an effect that has not been explored at the project level in prior literature.

These findings contribute to understanding project organizational culture and its impacts and can therefore help practitioners in the construction industry by providing guidance regarding how to identify key factors that affect construction project success and thereby ensure the appropriate allocation of limited resources. It would be illogical to devote resources to cultural change initiatives without any evidence of these initiatives' usefulness for improving project performance.

10.3 Research limitations

Beyond those highlighted in the preceding section, there are some other potential limitations that should be borne in mind when interpreting the findings of this research.

- A number of indicators were utilized as proxies for the measurement of both culture and performance within construction project context. However, these indictors may not be perfect displays and every empirical indicator has some defects (Babbie, 1990). Babbie (1990) also noted that theoretical concepts almost never have perfect indicators. Any given concept has several possible indicators and whilst theory and empirical evidence facilitate the identification of the most useful indicators, they do not give any guarantees that these indicators are indeed the best. Although this is a

potential limitation it is also important to emphasize that significant theoretical and empirical evidence were adduced to support the choice of these indicators.

- This study also suffers from some limitations in regard of sample. First, the size of the sample was relatively small, which may affect the significance level of the moderating effect. Increasing the sample size may yield new revelations. Second, there was a lack of diversity among respondents, who were overwhelmingly contractors (85%). The lack of stakeholder diversity may limit the perspective(s) offered by this particular study.
- This research was focused on national character (i.e., Vietnam), which is potentially characterized by the macro-cultural influences instead of, it is entirely plausible that there may be significant differences in the findings if this study is replicated in another jurisdiction. Indeed this aspect is recommended as a potential area for further research.

10.4 Recommendations for future research

Based on the findings of the research and the limitations that have been noted, a number of recommendations are put forward to provide some direction for future research endeavor in this domain as follows:

- This research revealed a significant links between the project organizational culture and the project performance. Although this association has not been confirmed as causation, it may be indicative of a causal effect of culture. The research findings provided a foundation for further investigation and validating this association. Future research in this genre must therefore make more effort in both data collections and effective analyses to enable the causal claims to be drawn from the finding models.
- It has been found in this research that the contractor commitment acts significantly to contribute enhancement most of project outcomes. It is therefore useful to undertake deeper investigation in exploring factors that affect this cultural orientation.
- As indicated in section 10.3, the research scope was limited with national character. As such, the replication of the research is probably significant differences in the findings due to the national geography of data collected. It will be interesting and useful for benchmarking purposes to find out if differences do exist and the effects (if

any) on project outcomes. It is therefore recommended that this study is replicated in other countries to allow for comparative analysis to be undertaken.

- Potentially, the models presented in this study reflect the cultural atmosphere of the traditional procurement system that is price based. As such, these culture dimensions also describe the limitations of this procurement system as claimed by a number of researchers. Therefore, it is useful to further conduct competitive investigations with other procurement approach, which may be useful for making policies in introducing other procurement methods (e.g., the best value approach). However this will require further data collection to test and compare the culture impacts of these procurement approaches.

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Appendices

Appendix A. Publications

Conferences:

Nguyen, L. H., and Watanabe, T. (2014). "Improvement for public construction works procurement in Vietnam." *2nd Vietnam-Japan Joint Workshop on Construction Management*, Ho Chi Minh city, Vietnam.

Nguyen, L. H., and Watanabe, T. (2014). "Effectiveness of the project for capacity enhancement in construction quality assurance." *JICA's Workshop*, December 2014, Tokyo, Japan.

Nguyen, L. H., and Watanabe, T. (2015). "Quality assurance of public construction works in Vietnam : a perspective under project organizational culture." *3nd Vietnam-Japan Joint Workshop on Construction Management*, Hanoi, Vietnam.

Nguyen, L. H., and Watanabe, T. (2015). "An investigation of project organizational culture: The case of Vietnam's construction industry." *The 3rd PC and the 10th SSMS International Conference*, 26th- 27th October, 2015 in Bandung, Indonesia.

Journals:

Nguyen, L. H., and Watanabe, T. (2014). "The status quo and perspective for improvement of public works procurement performance in Vietnam." *J. Adv. Perform. Informat. Value*, 6(1), 22-39.

Nguyen, L.H., Watanabe,T., and Le,T.T. (2015). "An investigation of the relationship between project organizational culture and procurement approach of construction project organizations." *Internet Journal for Society for Social Management Systems*, SMS15-3292.

Appendix B. Interview schedule

Introduction

Could you please provide a brief introduction of yourself: occupation; current position within company/organization; how long have you worked within the construction industry?

What is the current problem of construction industry?

(1) What are the core problems of the industry?
(2) Could you describe those problems in detail?

What is the project organizational culture?

(3) Have you ever heard of culture as a general concept or from the perspective of project management?
(4) What do you understand about culture at the project level?
(5) How would you describe project organizational culture?
(6) Based on the list of organizational culture artifacts derived from the literature, what are reasonable measures of project organizational culture?

What is the project performance?

(7) How would you describe performance indicators?
(8) In your experience, which performance indicators do you think are reasonable for measuring performance? Which performance indicators would be difficult to measure?
(9) In your experience, what types of participant behavior or attitudes during project delivery lead to good or poor performance?

Appendix C. Main questionnaires

Graduate School of Engineering,
Kochi University of Technology

Title of research: An investigation of the influence of project organizational culture on construction project performance: A study on Vietnam.

Researcher: Mr. Nguyen Luong Hai, PhD Candidate
Supervisor: Prof. Dr. Tsunemi Watanabe

Dear Sir/Madam,

I am a doctoral candidate in the Kochi University of Technology, Japan. The main aim of my research is to examine the influences of project organizational culture on the performance of construction projects. This questionnaire helps to identify significant influences of project organizational culture on performance of construction projects. When answering questions in the questionnaire, please note there is no expected right or wrong answer for each question/ statement. What we hope from you is frank and impartial opinion based on your practical experience. All the answers will remain confidential, and all the information will be analyzed in general, without reference to specific individuals.

Please choose ONE COMPLETED PROJECT to fill in the attached questionnaire based on your experience during the involvement in this project.

The close date of this survey will be on 15th June 2015. Your assistance is greatly appreciated. This survey is being conducted with the full support of the Kochi University of Technology. Your support and contribution play the vital role for future completion of our study and we greatly appreciate your time and cooperation.

Yours Faithfully,
The authors

QUESTIONAIRE SURVEY

Please chose the most recently completed project on which you were personally involved and provide appropriate answers to the questions/or descriptions below

A- Personal details

1. Name:……Email:……
   ……
2. Your position (title): ……
3. Your experience in the construction industry is (year): ☐1-5 ☐ 6-10 ☐11-15 ☐16-20 ☐>20
4. Your organization involved in the project as: ☐ Client ☐Supervision ☐Prime constructor ☐ Sub-constructor ☐ other (specify): …….
5. Your role in the project is: ……..

B- Project characteristics:

6. Type of project is: ☐ Transportation infrastructure; ☐ Building; ☐ Industrial; ☐ Other (specify): …
7. Type of project fund: ☐ Public fund ☐ offshore fund (ODA...) ☐ Private fund ☐ other (specify): ……..
8. Project capacity: ☐Small scale (<=15 VND bil.) ☐ Medium to big scale (>= 15 VND bil.). ☐ National important project.
9. Contract (procurement) method: ☐Traditional procurement (DBB) ☐ EPC ☐BOT, BT, BOO… ☐others ……
10. Bidding method: ☐Open competition bidding ☐ Limited competitive bidding ☐ designated bidding☐ others: ……
11. Complexity of the project: ☐ Very simple ☐ Simple ☐ Normal ☐ Complicate ☐ Very complicate
12. Rank priority of the project on following objectives (1indecates the most important):

Objective	Cost	Time	Quality	Safety & Environment	Other(specify):
rate (1→ 4)					

13. Rate the level of participants' influence into the project:

Participants	**Influence Level**				
	1.Not at all	2.Slightly	3.Neutral	4.Very	5.Extremely
Decision maker	1.☐	2.☐	3.☐	4.☐	5.☐
Client	1.☐	2.☐	3.☐	4.☐	5.☐
Project manager	1.☐	2.☐	3.☐	4.☐	5.☐
Supervision	1.☐	2.☐	3.☐	4.☐	5.☐
Main constructor	1.☐	2.☐	3.☐	4.☐	5.☐
Sub constructor	1.☐	2.☐	3.☐	4.☐	5.☐
Other (specify) ……	1.☐	2.☐	3.☐	4.☐	5.☐

Based on your experience on the project described, please specify the extent to which you agree that the following conditions and behaviors were present on site. Choose ***strongly agree*** *only for those conditions that were consciously promoted on this project.*

ID	**Contents**	**Answers**				
		1.Strongly disagree	**2.Disagree**	**3.Neutral**	**4.Agree**	**5.Strongly agree**
C-	**Tender evaluation process**					
14.	Bidding competition was conducted fairly and transparently.	1.☐	2.☐	3.☐	4.☐	5.☐
15.	External intervention did not affect the bid award	1.☐	2.☐	3.☐	4.☐	5.☐
16.	Past performance of the award tenderer was substantially trusted	1.☐	2.☐	3.☐	4.☐	5.☐
17.	The winner expressed sufficiently capabilities during executing works.	1.☐	2.☐	3.☐	4.☐	5.☐
D-	**The project organizational culture.**					
18.	All project participants on this project shared a clear understanding of the objectives and values of the project.	1.☐	2.☐	3.☐	4.☐	5.☐
19.	The contractors on this project clearly understood what roles and duties were	1.☐	2.☐	3.☐	4.☐	5.☐

	required of them.					
20.	The client on this project clearly understood what roles and duties were required.	1.☐	2.☐	3.☐	4.☐	5.☐
21.	All project participants understood each other's objectives, expectations and values.	1.☐	2.☐	3.☐	4.☐	5.☐
22.	When disputes or conflicts occurred, participants first looked to how the project would benefit instead themselves.	1.☐	2.☐	3.☐	4.☐	5.☐
23.	There were effective working relationships among the participants in exploring innovative solutions and bringing down costs and time.	1.☐	2.☐	3.☐	4.☐	5.☐
24.	Information was shared, transparent, and available for participants during the course of the project.	1.☐	2.☐	3.☐	4.☐	5.☐
25.	Project managers provided clear communication, assistance and support to their subordinates.	1.☐	2.☐	3.☐	4.☐	5.☐
26.	A high level of mutual trust was shared by the project participants.	1.☐	2.☐	3.☐	4.☐	5.☐
27.	The participants were not consistently open and respectful of each other.	1.☐	2.☐	3.☐	4.☐	5.☐
28.	The participants were not really willing to exchange ideas and help each other.	1.☐	2.☐	3.☐	4.☐	5.☐
29.	Assigning blame and accountability issues were very common when things went wrong.	1.☐	2.☐	3.☐	4.☐	5.☐
30.	All project participants were viewed as important contributors to the project's success.	1.☐	2.☐	3.☐	4.☐	5.☐
31.	Opportunities were provided to develop the capabilities of project participants during the project process.	1.☐	2.☐	3.☐	4.☐	5.☐
32.	Project participants were empowered to make	1.☐	2.☐	3.☐	4.☐	5.☐

	decisions at any level by themselves.					
33.	Project participants did not take pride in or celebrate achievements when achieving production milestones.	1.☐	2.☐	3.☐	4.☐	5.☐
34.	Workers were not given the opportunity to attend any training sessions about skills and safety.	1.☐	2.☐	3.☐	4.☐	5.☐
35.	Workers were not really respected.	1.☐	2.☐	3.☐	4.☐	5.☐
36.	Workers were not concerned about health and welfare.	1.☐	2.☐	3.☐	4.☐	5.☐
37.	The contractors shared a high degree of commitment to making the project successful with regard to quality.	1.☐	2.☐	3.☐	4.☐	5.☐
38.	The contractors shared a high degree of commitment to making the project successful with regard to the schedule.	1.☐	2.☐	3.☐	4.☐	5.☐
39.	The contractors shared a high degree of commitment to making the project successful with regard to contract costs.	1.☐	2.☐	3.☐	4.☐	5.☐
40.	The supervisory consultants shared a high degree of commitment to making the project successful.	1.☐	2.☐	3.☐	4.☐	5.☐
41.	The client shared a high degree of commitment to the contract agreements.	1.☐	2.☐	3.☐	4.☐	5.☐
42.	Strong leadership was shown by those who were project leaders.	1.☐	2.☐	3.☐	4.☐	5.☐
43.	Decision-making was liberally encouraged at every level.	1.☐	2.☐	3.☐	4.☐	5.☐
44.	Leaders always made sure that their subordinates knew what was expected of them.	1.☐	2.☐	3.☐	4.☐	5.☐
45.	Leaders did not always make sure that individual accountability was clear.	1.☐	2.☐	3.☐	4.☐	5.☐

46.	Everyone was not given the opportunity to participate in the decision making.	1.☐	2.☐	3.☐	4.☐	5.☐

Please indicate the extent to which of satisfaction on indication of project performance below.

	E- Project performance	**1.Not at all satisfied**	**2.Slightly satisfied**	**3.Moderately satisfied**	**4.Verysatisfied**	**5.Extremly satisfied**
47.	The client was satisfied with the project quality.	1.☐	2.☐	3.☐	4.☐	5.☐
48.	The client was satisfied with the project schedule.	1.☐	2.☐	3.☐	4.☐	5.☐
49.	The client was satisfied with the project cost.	1.☐	2.☐	3.☐	4.☐	5.☐
50.	Safety and environmental conditions in the course of project were satisfied.	1.☐	2.☐	3.☐	4.☐	5.☐
51.	How satisfied was the contractor with the level of profitability of this project.	1.☐	2.☐	3.☐	4.☐	5.☐
52.	Rate the labor productivity.	**Very low**	**Low**	**neutral**	**High**	**Very high**
53.	Rate the learning of the participants from the project.	1.☐	2.☐	3.☐	4.☐	5.☐

54. Have you ever heard with project culture? ☐ **Yes**. ☐ **No**.

55. In your opinion, are there appropriate project performances? (1) Quality, (2) Schedule, (3) Cost, (4) Safety and Environment,(5) Profitability ? ☐ **Yes** ☐ **No**

If No, Please give your opinions in detail: ……
……

56. According to your understanding and experience, who can be appropriate to answer the questionnaire items?

☐ Architects ☐ Designers ☐ Surveyors ☐ Project managers ☐ Engineers ☐ supervisory officers ☐ other (specify): …….

Appendix D. Project profiles in the survey

Table 1 Project type description

Project type	Projects surveyed (N)	Projects surveyed (%)
Proj_type1		
Transport infrastructure (T)	107	54.00
Building (B)	78	39.50
Industry (I)	6	3.00
Factory (F)	4	2.00
Water system (W)	3	1.50
Total	198	100
Proj_type2		
State investment	107	54.00
Private investment	48	24.30
Overseas investment	43	21.70
Total	198	100
Proj_type3		
Big scale (National level)	49	25.60
Medium scale (Budget >15 bil. VND)	113	59.20
Small scale (Budget <=15 bil. VND)	29	15.20
Total	191	100

Table 2 Project complexity statistic

```
vars   n mean   sd median trimmed mad min max range skew kurtosis   se
   1 194 3.43 0.66      3    3.41   0   1   5     4 0.14     0.46 0.05
```

Table 3 Chi-square test results for distribution of procurement methods

```
Chi-squared test for given probabilities

data:  Procurement methods
X-squared = 371.2251, df = 4, p-value < 2.2e-16
```

Table 4 Chi-square test results for distribution of bid methods

```
Chi-squared test for given probabilities

data:  bid methods
X-squared = 75.8477, df = 2, p-value < 2.2e-16
```

Table 5 Statistical description of bid criteria

Criteria	Coding	n	mean	sd	median	min	max	se
Fair and transparent competition	Bid_f.t1	197	3.21	0.99	3	1	5	0.07
No intervention to bid process	Bid_intl2	197	3.07	1.00	3	1	5	0.07
Trust on past performance	Bid_past3	196	3.61	0.75	4	1	5	0.05
Reasonable capability of constructor on site	Bid_cap4	196	3.62	0.81	4	1	5	0.06

Appendix E Cultural artifacts constructed from questionnaire items

No1	Coding of questionnaire items	Questionnaire items
1	CG1	Objective understanding
2	CG2	Roles and duties of contractor
3	CG3	Roles and duties of client
4	CG4	Mutual understanding
5	CG5	Looking forward to project benefits
6	CC1	Effective working relationships
7	CC2	Information sharing
8	CC3	Encouragement given by project manager
9	CC4	Mutual trust
10	CC5	Openness and mutual respect
11	CC6	Exchanges of ideas and support
12	CC7	Accountability and assignment of blame
13	CP1	Importance of people's contributions
14	CP2	Available opportunities
15	CP3	Empowering assignments
16	CP4	Recognition of achievements
17	CP5	Training sessions
18	CP6	Respect for workers
19	CP7	Concern for workers
20	CCM1	Contractor commitment to quality
21	CCM2	Contractor commitment to schedule
22	CCM3	Contractor commitment to budget
23	CCM4	Supervisor commitment
24	CCM5	Client commitment to agreements
25	CH1	Leaders' leadership
26	CH2	Encouragement of decision making
27	CH3	Leaders' direction
28	CH4	Leaders' instruction
29	CH5	Involvement in decision making

Appendix F Factor analysis of cultural artifacts

Table 1 KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.924
Bartlett's Test of Sphericity	Approx. Chi-Square	3.130E3
	df	406
	Sig.	.000

Table 2 Communalities

	Initial	Extraction
CG1	1.000	.643
CG2	1.000	.553
CG3	1.000	.501
CG4	1.000	.599
CG5	1.000	.443
CC1	1.000	.635
CC2	1.000	.550
CC3	1.000	.611
CC4	1.000	.521
CC5	1.000	.666
CC6	1.000	.670
CC7	1.000	.621
CP1	1.000	.561
CP2	1.000	.635
CP3	1.000	.490
CP4	1.000	.489
CP5	1.000	.767

CP6	1.000	.799
CP7	1.000	.775
CCM1	1.000	.723
CCM2	1.000	.843
CCM3	1.000	.751
CCM4	1.000	.600
CCM5	1.000	.554
CH1	1.000	.646
CH2	1.000	.660
CH3	1.000	.620
CH4	1.000	.609
CH5	1.000	.589

Extraction Method: Principal Component Analysis.

Table 3 Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.471	43.003	43.003	12.471	43.003	43.003	4.826	16.641	16.641
2	1.856	6.399	49.402	1.856	6.399	49.402	3.987	13.749	30.389
3	1.493	5.149	54.551	1.493	5.149	54.551	3.341	11.521	41.910
4	1.233	4.252	58.803	1.233	4.252	58.803	3.271	11.279	53.190
5	1.069	3.686	62.488	1.069	3.686	62.488	2.697	9.299	62.488
6	.954	3.290	65.779						

7	.839	2.894	68.672
8	.817	2.818	71.490
9	.715	2.465	73.955
10	.635	2.191	76.146
11	.607	2.094	78.240
12	.575	1.984	80.224
13	.542	1.870	82.094
14	.496	1.710	83.805
15	.481	1.658	85.463
16	.461	1.588	87.051
17	.442	1.523	88.574
18	.420	1.450	90.023
19	.408	1.406	91.429
20	.356	1.229	92.658
21	.345	1.191	93.849
22	.330	1.137	94.986
23	.301	1.038	96.024
24	.261	.901	96.925
25	.226	.781	97.706
26	.204	.703	98.409

27	.187	.646	99.055						
28	.164	.564	99.619						
29	.110	.381	100.000						

Extraction Method: Principal Component Analysis.

Table 4 Component Matrix[a]

	Component				
	1	2	3	4	5
CG1	.619	.419			
CG2	.583				
CG3	.544	.404			
CG4	.516	.458			
CG5	.621				
CC1	.752				
CC2	.691				
CC3	.705				
CC4	.682				
CC5	.729				
CC6	.684				
CC7	.678				
CP1	.665				
CP2	.701				
CP3	.558			.400	

CP4	.658				
CP5	.662	-.503			
CP6	.691	-.421			
CP7	.671	-.428			
CCM1	.666				
CCM2	.641		.539		
CCM3	.626		.433		
CCM4	.742				
CCM5	.735				
CH1	.735				
CH2	.507			.631	
CH3	.617				
CH4	.566				.428
CH5	.676				

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

Table 5 Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
CG1	.716				
CG2	.520		.507		
CG3	.644				

CG4	.724				
CG5		.478			
CC1	.444	.479			
CC2	.577				
CC3	.498		.414		
CC4	.535				
CC5	.466	.592			
CC6	.421	.569		.400	
CC7		.645			
CP1	.537				
CP2	.525			.413	.401
CP3					.581
CP4		.412			
CP5				.739	
CP6				.787	
CP7				.779	
CCM1			.743		
CCM2			.839		
CCM3			.789		
CCM4	.512				
CCM5	.404	.441			
CH1	.466	.411			
CH2					.770

CH3		.408			.613
CH4		.697			
CH5		.624			

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

Appendix G Kruskal-Wallis and Post hoc analysis results for culture and project characteristics

Table 1 Kruskal-Wallis test results for bid criteria and project characteristics

	Statistics	Bid_f.t1	Bid_intl2	Bid_past3	Bid_cap4
Proj_type1	chi-squared	4.524	6.971	9.180	3.279
	df	4	4	4	4
	p-value	0.339	0.137	0.057	0.512
Proj_type2	chi-squared	1.271	1.726	0.847	2.814
	df	2	2	2	2
	p-value	0.529	0.422	0.655	0.245
Proj_type3	chi-squared	0.312	0.244	4.337	3.281
	df	2	2	2	2
	p-value	0.855	0.885	0.114	0.194
Proc_med	chi-squared	0.388	0.809	3.186	1.186
	df	2	2	2	2
	p-value	0.823	0.667	0.203	0.552
Bid_med	chi-squared	2.235	9.191	0.057	4.374
	df	2	2	2	2
	p-value	0.327	**0.01009**	0.971	0.112

Table 2 Kruskal_Wallis post hoc analysis results for bid criteria and project characteristics

Test	Comparisions	obs.dif	critical.dif	difference
Bid_intl2 vs Bid_med	Competition-Designated	3.619	23.376	FALSE
	Competition-Limited	34.651	28.734	**TRUE**
	Designated - Limited	31.032	32.754	FALSE

Table 3 Descriptive of the *no bid intervention criterion* (Bid_intl2).

Bid_med	n	mean	sd	median	min	max	se
Competition	122	3.19	1.01	3	1	5	0.09
Designated	46	3.09	1.01	3	1	5	0.15
Limited	27	2.56	0.80	2	1	5	0.15

Table 4 Kruskal-Wallis test results for culture and project characteristics

	Statistics	C1	C2	C3	C4	C5
Type_Par	chi-squared	0.4944	1.7481	1.2685	0.9829	0.2934
	p-value	0.482	0.1861	0.26	0.3215	0.588
Proj_type1	chi-squared	9.2226	4.4433	9.6427	8.7356	15.4782
	p-value	0.05577	0.3493	**0.0469**	0.06806	**0.003806**
Proj_type2	chi-squared	0.4979	2.0259	2.311	2.1263	1.4264
	p-value	0.7796	0.3632	0.3149	0.3454	0.4901
Proj_type3	chi-squared	0.5633	2.916	0.2309	0.2449	1.1995
	p-value	0.7545	0.2327	0.891	0.8847	0.549
Proc_med	chi-squared	0.325	4.4425	4.2979	2.4069	6.0084
	p-value	0.9881	0.3494	0.3672	0.6614	0.1985
Bid_med	chi-squared	2.9462	1.8715	1.2579	0.5925	1.8721
	p-value	0.2292	0.3923	0.5331	0.7436	0.3922

Table 5 Kruskal-Wallis post hoc analysis results for cooperative orientation (C3) and project type (Proj_type1)

Comparisons	obs.dif	critical.dif	difference
B-F	46.26603	82.46046	FALSE
B-I	10.52564	68.14482	FALSE
B-T	19.71579	23.94765	FALSE
B-W	57.47436	94.63477	FALSE
F-I	56.79167	103.82705	FALSE

F-T	26.55023	81.91355	FALSE
F-W	11.20833	122.84983	FALSE
I - T	30.24143	67.48199	FALSE
I - W	68.00000	113.73684	FALSE
T-W	37.75857	94.15860	FALSE

Table 6 Kruskal-Wallis post hoc analysis results for worker orientation (C5) and project type (Proj_type1)

Comparisons	obs.dif	critical.dif	difference
B-F	33.5608974	82.46046	FALSE
B-I	21.4358974	68.14482	FALSE
B-T	32.8120657	23.94765	**TRUE**
B-W	8.3525641	94.63477	FALSE
F-I	12.1250000	103.82705	FALSE
F-T	0.7488318	81.91355	FALSE
F-W	25.2083333	122.84983	FALSE
I - T	11.3761682	67.48199	FALSE
I - W	13.0833333	113.73684	FALSE
T-W	24.4595016	94.15860	FALSE

Table 7 Correlation coefficient between bid criteria and culture

		C1	C2	C3	C4	C5
Bid_f.t1	Pearson Correlation	.539**	.480**	.514**	.437**	.566**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _intl2	Pearson Correlation	.463**	.419**	.457**	.448**	.522**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _past3	Pearson Correlation	.398**	.498**	.353**	.303**	.369**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _cap4	Pearson Correlation	.538**	.640**	.481**	.379**	.424**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table 8 Descriptive of culture of worker orientation (C5) in regard of project type (Proj_type1)

Proj_type1		n	mean	sd	median	min	max	se
Building	(B)	78	2.47	0.84	2.67	1.33	5.00	0.10
Factory	(F)	4	3.25	0.74	3.34	2.33	4.00	0.37
Industry	(I)	6	3.06	0.65	3.00	2.00	4.00	0.26
Transport Inf.	(T)	107	3.24	0.95	3.33	1.00	5.00	0.09
Water sys.	(W)	3	2.89	0.84	3.00	2.00	3.67	0.49

Appendix H identifying of project performance

Table 1 Performance indicators constructed from questionnaire items

No.	Item Coding	Performance measures
1	**Participant satisfaction**	
1.1	PP.Sat_qual	Client satisfaction with quality
1.2	PP.Sat_time	Client satisfaction with time
1.3	PP.Sat_cost	Client satisfaction with cost
1.4	PP.Sat_S&E	Client satisfaction with S&E
1.5	PP.Sat_Prof	Contractor satisfaction with project profitability
2	**Prod.P**	Labor productivity
3	**Lea.P**	Lessons learned
4	**Ovl.P**	Overall project performance

Table 2 Kruskal-Wallis test results

	Statistics	Participant satisfaction (Par.S.P)	Labor productivity (Prod.P)	Learning (Lea.P)	Overall performance (Ovl.P)
Types of respondents (Type_par)	chi-squared	1.063	0.534	0.000	0.648
	p-value	0.303	0.817	0.999	0.421

Appendix I Correlation matrix of culture and performance

		C1	C2	C3	C4	C5
Par.S.P	Pearson Correlation	.627**	.709**	.603**	.487**	.568**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	199	199	199	199	199
Prod.P	Pearson Correlation	.410**	.488**	.442**	.226**	.431**
	Sig. (2-tailed)	.000	.000	.000	.001	.000
	N	199	199	199	199	199
Lea.P	Pearson Correlation	.573**	.516**	.503**	.419**	.402**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	199	199	199	199	199
Ovl.P	Pearson Correlation	.640**	.717**	.618**	.494**	.580**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	199	199	199	199	199
***. Correlation is significant at the 0.01 level (2-tailed).*						