

การประเมินความขัดแย้งระหว่างเจ้าของโครงการภาครัฐกับผู้รับเหมาในช่วงการก่อสร้างโครงการ:
กรณีศึกษาในประเทศภูฏาน

นายไชนัม ทาทิ

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต
สาขาวิชาวิศวกรรมโยธา ภาควิชาวิศวกรรมโยธา
คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2556

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย
บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)
เป็นแฟ้มข้อมูลของนิสิตเจ้าของวิทยานิพนธ์ที่ส่งผ่านทางบัณฑิตวิทยาลัย

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EVALUATION OF CONFLICT ISSUES BETWEEN PUBLIC OWNERS AND
CONTRACTORS DURING CONSTRUCTION PHASE: A CASE STUDY IN
BHUTAN

Mr. Sonam Tashi

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Engineering Program in Civil Engineering

Department of Civil Engineering

Faculty of Engineering

Chulalongkorn University

Academic Year 2013

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Thesis Title EVALUATION OF CONFLICT ISSUES BETWEEN PUBLIC OWNERS AND CONTRACTORS DURING CONSTRUCTION PHASE: A CASE STUDY IN BHUTAN

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การก่อสร้างโครงการ: กรณีศึกษาในประเทศภูฏาน. (EVALUATION OF CONFLICT
ISSUES BETWEEN PUBLIC OWNERS AND CONTRACTORS DURING
CONSTRUCTION PHASE: A CASE STUDY IN BHUTAN), อ.ที่ปรึกษาวิทยานิพนธ์หลัก:
ผศ.ดร.วัชระ เพียรสุภาพ, 257 หน้า.

ความขัดแย้งในโครงการก่อสร้างเป็นสิ่งที่ไม่อาจหลีกเลี่ยงได้เนื่องจากลักษณะของ
โครงการก่อสร้างมีความไม่แน่นอน ซับซ้อน และมีผู้เกี่ยวข้องในโครงการหลายฝ่าย ความขัดแย้ง
ส่งผลให้เกิดความสัมพันธ์ในเชิงลบและก่อให้เกิดผลกระทบหลายด้านเช่น ความล่าช้า การ
เรียกร้องสิทธิ และข้อพิพาท ซึ่งเป็นปัญหาหลักต่อความสำเร็จของโครงการทั้งในด้านระยะเวลา
ต้นทุน คุณภาพ และความปลอดภัย งานวิจัยในอดีตสำรวจปัจจัยที่มีผลต่อความขัดแย้งและ
เสนอแนะแนวทางในการบริหารความขัดแย้ง อย่างไรก็ตามความขัดแย้งยังคงเกิดขึ้นในโครงการ
ก่อสร้าง ดังนั้นวัตถุประสงค์ของงานวิจัยจึงพยายามค้นหาประเด็นของความขัดแย้งที่สำคัญจาก
ทัศนคติและประเมินระดับของประเด็นความขัดแย้งที่เกิดขึ้น โดยวิธีวิจัยแบ่งการศึกษาออกเป็น 3
ส่วน ส่วนแรกเป็นการสำรวจทัศนคติที่มีต่อประเด็นความขัดแย้งที่สำคัญจากผู้ตอบแบบสอบถาม
จำนวน 78 คน ผลการวิเคราะห์พบประเด็นความขัดแย้งที่สำคัญหลัก 26 รายการ งานวิจัยในส่วน
ที่สองประเมินระดับของประเด็นความขัดแย้งที่เกิดขึ้นจากผู้ตอบแบบสอบถามจำนวน 49 คน ผล
การวิเคราะห์พบระดับของประเด็นความขัดแย้งเฉลี่ยอยู่ในระดับปานกลางและเป็นประเด็นที่
เกี่ยวข้องกับคุณภาพและระยะเวลาของโครงการเช่น (1) การใช้วัสดุที่มีคุณภาพต่ำและราคาถูก
(2) การขาดอุปกรณ์ในการทดสอบคุณภาพของงาน (3) ขาดการวางแผนโครงการที่ดี นอกจากนี้
ผลการศึกษายังพบสาเหตุของประเด็นความขัดแย้ง ได้แก่ การขาดแคลนช่างฝีมือแรงงาน การขาด
ทรัพยากร และการวางแผนที่ไม่มีศักยภาพ เป็นต้น นอกจากนี้งานวิจัยเสนอแนะแนวทางในการ
ป้องกันและลดประเด็นความขัดแย้งในโครงการก่อสร้างภาครัฐในช่วงของการก่อสร้าง

ภาควิชา.....วิศวกรรมโยธา..... ลายมือชื่อ.....
สาขาวิชา.....วิศวกรรมโยธา..... ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....
ปีการศึกษา.....2556.....

5470572921: MAJOR CIVIL ENGINEERING

KEYWORDS: CONFLICT ISSUES / EVALUATION /LEVEL OF CONFLICT/
CONSTRUCTION PHASE/ PUBLIC PROJECTS IN BHUTAN

SONAM TASHI: EVALUATION OF CONFLICT ISSUES BETWEEN
PUBLIC OWNERS AND CONTRACTORS DURING CONSTRUCTION
PHASE: A CASE STUDY IN BHUTAN. ADVISOR: ASST. PROF.
VACHARA PEANSUPAP, Ph.D., 257pp.

The conflict in the construction projects seems inevitable due to its uncertainty, complexity nature, and involvement with different categories of project participants. Conflict deteriorates relationships and results in project delays, claims and disputes which are the main drawbacks in completion of project within time, cost, quality, safety etc. The previous studies have explored on factors of conflict and attempted to manage conflicts, however the conflicts still occurs in construction projects. Therefore, the objectives of this study are to identify the important conflict issues from perception and to evaluate the level of conflict issues. The research methodology was designed into three parts. First, the perception of important conflict issues was evaluated by 78 respondents. The research found 26 important conflict issues as main conflict issues. Next, the level of conflict issues was rated by 49 respondents. The findings found several conflict issues related to time, cost, quality, safety, scope and personnel. The level of conflict was found moderate for conflict issues related to project quality and time such as (1) Use of low quality and cheap materials, (2) Inadequate quality testing facility and (3) Poorly develop project planning and scheduling. Furthermore, the research found several causes of conflict issues such as lack of skilled manpower, resource limitation, poor planning and management capacity etc. The research also recommended the solution to prevent and reduce the conflict issues in public projects during construction phase.

Department: Civil Engineering..... Student's Signature.....
Field of Study: Civil Engineering..... Advisor's Signature.....
Academic Year: 2013.....

ACKNOWLEDGEMENTS

I would like to thank GOD and express my sincere gratitude to all those who helped me with the prospect to accomplish this research.

First, I would like to extend my heartfelt gratitude and indebtedness to my research advisor, Dr.Vachara Peansupap, Ph.D. His steadfast responses for all academic enquiries since from the beginning of my sessions and term project on solutions to remote construction project management problems, and in addition towards throughout my stay in the university has crucial role for my success. His inspirational advices, assignation, remarks and encouragement have benefitted me to realize the real problems and issues in different approaches.

I would also like to extend my thankfulness to other professors as well as committee members for their comments, remarks, advices and direction especially during my presentation that has improved my presentation abilities and refurbished my research structure.

Furthermore, I extend my acknowledgment to International School of Engineering, Chulalongkorn University (ISE-CU) and Thailand International Development Cooperation Agency (TICA) for their genuine assistance and facilitation during my 2 years study program in this renowned university.

My special credit goes to Mr. Mahesh Pradhan (Chief Engineer), Mr. Samten Lhuendup (Engineer) and Mr. Ugyen Phuntsho (Project Engineer) for their invaluable support and provided necessary materials and information to complete the task. Further, I take this opportunity to thank all the Bhutanese engineers and contractors who have confidentially contributed in answering the questionnaires and generosity with their criticisms and opinions for the enhancement of this research.

Last not least, I dedicate this research to my beloved wife Tashi Yangzom and my first expectant child, my beloved parents, brother, sisters and all of them are extremely respected and gratefulness for their prayers, sacrifices, endurances and tolerances during the entire progress of my study.

CONTENTS

	Page
ABSTRACT (THAI).....	iv
ABSTRACT (ENGLISH).....	v
ACKNOWLEDGEMENTS.....	vi
CONTENTS.....	vii
LIST OF TABLES.....	xii
LIST OF FIGURES.....	xiv
LIST OF ABBREVIATIONS.....	xvii
CHAPTER I INTRODUCTION.....	1
1.1 Importance of Conflict Management.....	1
1.2 Problem Statement.....	2
1.3 Research Objectives.....	4
1.4 Scope of Research.....	5
1.5 Research Methodology.....	5
1.6 Research Outline.....	7
1.7 Research Outcome and Benefits.....	8
CHAPTER II LITERATURE REVIEW.....	9
2.1 Current Construction Industry in Bhutan.....	9
2.1.1 Current Issues of Construction Sector.....	12
2.1.2 Current situations of Construction.....	12
2.2 Phenomena of Conflict in Construction Projects.....	13
2.2.1 Definition of Conflicts.....	13
2.2.2 Types of Conflicts.....	14
2.2.3 Differences between Risks, Conflicts, Claims and Disputes.....	15
2.3 Conflict Dynamics in Construction Projects.....	19
2.3.1 Conflict Curve.....	19
2.3.2 Pondy's stage of Conflict development.....	20

	Page
2.4 Overview of Conflicts in Construction Projects.....	22
2.4.1 Nature of Conflicts in Construction projects.....	22
2.4.2 Causes of conflicts in Construction Projects.....	23
2.4.3 Conflict Issues in Construction Project.....	25
2.5 Previous Researches on Conflict Management.....	27
2.5.1 Identifying Causes and Factors of conflicts.....	28
2.5.2 Conflict Resolution Approaches.....	34
2.5.3 Conflict Prevention Strategies.....	37
2.6 Research gaps.....	39
2.7 Summary.....	41
CHAPTER III RESEARCH METHODOLOGY.....	43
3.1 Research Approach.....	43
3.2 Research Design.....	44
3.3 Data Collection Method.....	46
3.3.1 Target Population and Sampling Method.....	46
3.3.2 Questionnaire Design.....	46
3.3.3 Questionnaire Method of Data Collection.....	52
3.3.4 Qualitative Data Collection.....	53
3.4 Data Analysis.....	55
3.4.1 Mean and Standard Deviation.....	55
3.4.2 Independent-Samples T-test.....	57
3.4.3 Conflict Level and Qualitative Results.....	58
3.5 Summary.....	59
CHAPTER IV IDENTIFYING PUBLIC OWNERS AND CONTRACTOR'S PERCEPTION ON IMPORTANT CONFLICT ISSUES	60
4.1 General Survey Details and Respondents Profile.....	60
4.1.1 Response Rate.....	60
4.1.2 Respondent's working experience.....	61

	Page
4.1.3 Position and Qualification of Respondents.....	62
4.1.4 Data Screening and Treatment.....	64
4.2 Identifying Public Owners and Contractor’s Perception on Important Conflict Issues.....	65
4.2.1 Ranking Public Owner’s Perception on Important Conflict Issues.....	65
4.2.1.1 Important Conflict Issue related to Time from Public Owner’s Perception.....	68
4.2.1.2 Important Conflict Issue related to Quality from Public Owner’s Perception.....	69
4.2.1.3 Important Conflict Issue related to Safety from Public Owner’s Perception.....	72
4.2.1.4 Important Conflict Issue related to Scope from Public Owner’s Perception.....	72
4.2.1.5 Important Conflict Issue related to Personnel from Public Owner’s Perception.....	73
4.2.2 Ranking Contractor’s Perception on Important Conflict Issues.....	75
4.2.2.1 Important Conflict Issue related to Time from Contractor’s Perception.....	77
4.2.2.2 Important Conflict Issue related to Cost from Contractor’s Perception.....	78
4.2.2.3 Important Conflict Issue related to Quality from Contractor’s Perception.....	78
4.2.2.4 Important Conflict Issue related to Safety from Contractor’s Perception.....	80
4.2.2.5 Important Conflict Issue related to Scope from Contractor’s Perception.....	81
4.2.2.6 Important Conflict Issue related to Personnel from Contractor’s Perception.....	82
4.3 Independent-Samples T-Test Analysis Result.....	82
4.4 Summary.....	84

	Page
CHAPTER V EVALUATING LEVEL OF CONFLICTS IN PUBLIC PROJECTS FROM PUBLIC OWNERS AND CONTRACTORS.....	86
5.1 Description of Survey data.....	86
5.1.1 Response rate.....	87
5.1.2 Respondent's working experience.....	87
5.1.3 Position and Qualification of Respondents.....	88
5.2 Analysis of Level of Conflicts.....	90
5.3 Result of Conflict Levels evaluated by Public Owners.....	90
5.3.1 Evaluating Level of Conflicts in Public Projects from Public Owners...	92
5.4 Result of Conflict Levels evaluated by Contractors.....	144
5.4.1 Evaluating Level of Conflicts in Public Projects from Contractors.....	145
5.5 Discussion Result.....	177
5.5.1 Comparison of Perception and Evaluation Results from Public Owners	177
5.5.2 Comparison of Perception and Evaluation Results from Contractors.....	179
5.5.3 Comparison of Current Research Results with Previous Research.....	180
5.5.4 Box-and-Whisker Plots for various Conflict Levels.....	183
5.6 Summary.....	186
 CHAPTER VI ANALYSIS OF ROOT CAUSES AND SOLUTIONS TO REDUCE CONFLICT.....	 187
6.1 Qualitative Analysis of Interview Results and Interpretation.....	187
6.2 Root Causes and Solutions for 10 Critical Conflict Issues.....	188
6.3 Recommendations and Solutions to Reduce Conflict Issues.....	202
6.3.1 Recommendation for Public owners.....	203
6.3.2 Recommendations for Contractors.....	203
6.3.3 Recommendations to Departments.....	204
6.4 Summary.....	205
 CHAPTER VII RESEARCH CONCLUSION.....	 206
7.1 Research Conclusions.....	206

	Page
7.1.1 Perceptions of Important Conflict Issues in Public Projects.....	206
7.1.2 Evaluation of Level of Conflicts in Public Projects.....	208
7.1.3 Root Causes and Solutions to Reduce Critical Conflict Issues in Public Projects.....	210
7.2 Research Contribution.....	211
7.3 Limitations and direction for future research.....	212
REFERENCES.....	214
APPENDICES.....	217
Appendix A Survey Questionnaire Form and Data in Part-I.....	218
Appendix B Analysis of Survey Questionnaires in Part-I.....	226
Appendix C Survey Questionnaire Form, Raw Data and Analysis in Part-II..	234
Appendix D Respondent Information in Survey Part-I, II and Interview.....	252
BIOGRAPHY.....	257

LIST OF TABLES

	Page
Table 2.1(a) List of registered Contractors in Bhutan (Source: CDB, 2012).....	11
Table 2.5(a) Areas of conflicts and their possible causes in public building projects in Tanzania (Source: Stanslaus, 2011).....	29
Table 2.5(b) Source and causes of conflicts in Saudi Arabia public projects.....	32
Table 2.5(c) Comparison of ranking of resolution approaches applied (Source: Sedairy, 1994 and Stanslaus, 2011).....	37
Table 2.6(a) Research gaps (Stanslaus, 2011; Acharya, 2006; Sedairy, 1994)...	41
Table 3.1 Comparison of different data measurement scales (Source: Hardegree, 1980; Clasonand Dormody, 1994).....	47
Table 3.2 Likert scale type used for measuring perceptions.....	48
Table 3.3 Likert scale type for measuring level of conflicts.....	48
Table 3.4 Summary of Conflict Issues from Literature.....	49
Table 3.5 Summary of Conflict Issues from Experts.....	51
Table 4.1 Details of questionnaires distribution and their responses (Part-I).	61
Table 4.2 Respondent's experience in public projects (Part-I).....	62
Table 4.3 Respondent's qualification in public projects (Part-I).....	63
Table 4.4 Position of respondents in public projects (Part-I).....	63
Table 4.5 Ranking results of Important Conflict Issues from Public Owner's Perception.....	66
Table 4.6 Ranking of Important Conflict Issues related to Time from Public Owner's Perception.....	68
Table 4.7 Ranking of Important Conflict Issues related to Quality from Public Owner's Perception.....	70
Table 4.8 Ranking of Important Conflict Issues related to Safety from Public Owner's Perception.....	72
Table 4.9 Ranking of Important Conflict Issues related to Scope from Public Owner's Perception.....	73

	Page
Table 4.10 Ranking of Important Conflict Issues related to Personnel and Others from Public Owner's Perception.....	74
Table 4.11 Ranking result of Important Conflict Issues from Contractor's Perception.....	75
Table 4.12 Ranking of Important Conflict Issues related to Time from Contractors Perception.....	77
Table 4.13 Ranking of Important Conflict Issues related to Cost from Contractors Perception.....	78
Table 4.14 Ranking of Important Conflict Issues related to Quality from Contractors Perception.....	79
Table 4.15 Ranking of Important Conflict Issues related to Safety from Contractors Perception.....	80
Table 4.16 Ranking of Important Conflict Issues related to Scope from Contractors Perception.....	81
Table 4.17 Ranking of Important Conflict Issues related to Personnel and Others from Contractors Perception.....	82
Table 5.1 Details of Questionnaires distribution and their responses (Part-II)	87
Table 5.2 Respondent's experience in public projects (Part-II).....	88
Table 5.3 Respondent's qualification in public projects (Part-II).....	89
Table 5.4 Position of respondents in public projects (Part-II).....	89
Table 5.5 Result of Conflict Levels evaluated by Public Owners.....	91
Table 5.6 Result of Conflict Levels evaluated by Contractors.....	144
Table 5.7 Comparative Result of Perception and Evaluation from Public Owners.....	178
Table 5.8 Comparative Result of Perception and Evaluation from Contractor	179
Table 5.9 Comparison of Current Research Results with Previous Research..	182

LIST OF FIGURES

	Page
Figure 2.1(a) Contributions to GDP by Construction Industry in 2010 (Source: National Statistical Bureau (NSB) of Bhutan (2010)).....	10
Figure 2.2(a) Levels and types of Conflict (Source: Moore, 1986; Gordon, 1966; Jackson et.al, 2008; Simmons and Peterson, 2000).....	15
Figure 2.2(b) Difference between Risk, Conflicts, Claims and Dispute (Source: Acharya, Leehas and Im, 2006).....	16
Figure 2.2(c) Intensity of Conflict Curve (source: Yates and Hardcastel, 2003)	17
Figure 2.2(d) Conflict Level in construction projects (Source: Handy, 1983).....	19
Figure 2.3(a) Conflict Curve (Source Groton, 1997).....	20
Figure 2.3(b) Pondy's Stages of Conflict Model (source: Pondy, 1967).....	21
Figure 2.4(a) Fishbone diagram representing causes of conflicts (Source: Mosta, 2006).....	24
Figure 2.4(b) Conflict Situations at project life cycle (Source: Pondy, 1967; Groton, 1997; Mora et.al., 2002).....	27
Figure 2.5(a) Previous Research theme on Conflict Management (Source: Sedairy, 1994; Acharya, 2006; Stanslaus, 2011).....	28
Figure 2.5(b) Thomas-Kilmann Conflict resolution strategies (Source: Stanslaus, 2011).....	35
Figure 2.5(c) Conflict Avoidance model (Source: Archarya, 2006).....	38
Figure 3.1 Research design and framework.....	45
Figure 4.1 Respondent's working experience in public projects (Part-I).....	62
Figure 4.2 Frequency distribution of respondent's qualification (Part-I).....	63
Figure 4.3 Percentage distribution of respondent's position (Part-I).....	64
Figure 5.1 Percentage distribution of respondent's position (Part-II).....	89
Figure 5.2 Conflict distribution on "Use of low quality and cheap materials.	93
Figure 5.3 Conflict distribution on "Inadequate quality testing facility".....	95
Figure 5.4 Conflict distribution on "Inadequate supervision, regular inspection on construction site by client engineer".....	97

	Page
Figure 5.5 Conflict distribution for “Poorly develop project planning and Scheduling”	100
Figure 5.6 Conflict distribution for “Frequent change orders causes uncontrolled project schedule”	102
Figure 5.7 Conflict distribution for “Slow progress/performance by contractors”	105
Figure 5.8 Conflict distribution for “Time extension due to design changes..	107
Figure 5.9 Conflict distribution for “Late payment by client”	110
Figure 5.10 Conflict distribution for “An unforeseen underground condition”	112
Figure 5.11 Conflict distribution for “Poor workmanship or rework due to non-compliance with methods and good practices”	114
Figure 5.12 Conflict distribution for “Non-compliance with quality control/quality assurance system or processes”	116
Figure 5.13 Conflict distribution for “Ambiguous instructions and unqualified / unskilled operators or worker”	119
Figure 5.14 Conflict distribution for “Non-compliance with occupational health and safety regulations”	122
Figure 5.15 Conflict distribution for “Frequent change orders cause extra cost of work preparation or rework”	125
Figure 5.16 Conflict distribution for “Shortage or absence of competent managerial or supervisory personnel at construction site”	127
Figure 5.17 Conflict distribution for “Slow decision making by client”	130
Figure 5.18 Conflict distribution for “Lack of detail drawing”	132
Figure 5.19 Conflict distribution for “Lack of clear information to address price Escalation index”	134
Figure 5.20 Conflict distribution for “Excessive variations of quantity such as requiring massive earth excavation”	137
Figure 5.21 Conflict distribution for “Irresponsibility/ Lack of commitment/ attitude & personality problem”	139

	Page
Figure 5.22 Conflict distribution for “Unclear/Incomplete technical specifications”.....	142
Figure 5.23 Conflict distribution for “Late payment by client”.....	148
Figure 5.24 Conflict distribution for “Lack of detail drawing”.....	150
Figure 5.25 Conflict distribution for “Time extension due to design changes..	153
Figure 5.27 Conflict distribution for “Frequent change orders causes uncontrolled project schedule”.....	155
Figure 5.28 Conflict distribution on “Inadequate supervision, regular inspection on construction site by client engineer”.....	157
Figure 5.29 Conflict distribution for “Slow decision making by client”.....	159
Figure 5.30 Conflict distribution for “Ambiguous instructions and unqualified / unskilled operators or worker”.....	161
Figure 5.31 Conflict distribution for “Lack of clear information to address price Escalation index”.....	164
Figure 5.32 Conflict distribution for “Slow progress/performance by contractors”.....	166
Figure 5.33 Conflict distribution for “Non-compliance with quality control/quality assurance system or processes”.....	169
Figure 5.34 Conflict distribution for “Shortage or absence of competent managerial or supervisory personnel at construction site”.....	171
Figure 5.35 Conflict distribution for “Irresponsibility/ Lack of commitment/ attitude & personality problem”.....	173
Figure 5.36 Conflict distribution for “Poorly develop project planning and Scheduling”.....	176
Figure 5.37 Box-and-Whisker Plots from Public Owners.....	183
Figure 5.37 Box-and-Whisker Plots from Contractors.....	185
Figure 6.1 Causes of using of low quality and cheap materials.....	189
Figure 6.2 Causes of “Inadequate quality testing facility”.....	190

	Page
Figure 6.3 Causes of “Inadequate supervision, regular inspection on construction site by client engineer”.....	192
Figure 6.4 Causes for “Poorly develop project planning and scheduling”.....	193
Figure 6.5 Causes for “Frequent change orders causes uncontrolled project schedule”.....	195
Figure 6.6 Causes for “Slow progress/performance by contractors”.....	196
Figure 6.7 Causes for “Time extension due to design changes.....	197
Figure 6.8 Causes for “Late payment by client”.....	199
Figure 6.9 Causes for “An unforeseen underground condition”.....	200
Figure 6.10 Causes for “Poor workmanship or rework due to non-compliance with methods and good practices”.....	201

LIST OF ABBREVIATIONS

SD	Standard deviation
DV	Dependent Variables
IV	Independent Variables
CL	Conflict Level
Freq	Frequency
Cum	Cumulative
PO	Public Owner
CON	Contractor
ITB	Instruction to Bidders
GCC	General Conditions of Contract
SCC	Special Conditions of Contract
QAP/QAS	Quality Assurance Program/System
MB	Measurement Book
CDB	Construction Development Board
CAB	Construction Association of Bhutan
SQCA	Standard and Quality Control Authority
MOWHS	Ministry of Works and Human Settlement
NEC	National Environment Commission
NSB	National Statistical Bureau
ADB	Asian Development Bank
WB	World Bank

CHAPTER I

INTRODUCTION

1.1 Importance of Conflict Management

Conflict in construction project is defined as non-conformance with the procedures or techniques or a situation in which two or more people appear to be incompatible on objectives, goals and priorities (Gardiner and Simmons, 1992). It has also been perceived as disagreement and opposition between people about something relating to individual's interests, beliefs, ideas, goals and needs (Hellard, 1988). Handy (1983), Brown and Marriot (1993) have defined a conflict as a situation when one person finds the other has discouraged and become frustrated or non-cooperative because of contradiction among objectives, priorities and accomplishment of goals. From those various definitions and views on conflict it can be understood that conflicts are always part of occurrence in construction project.

The conflicts in constructions are inevitable (Fenn et al., 1997; Kumaraswamy, 1998). It is subjected to some tendencies of conflicts when there is dissatisfaction and distrusts among project participants (Houghton, 1992). Recently, construction projects have become more difficult and sensitive in nature with increasing technologies, budgets and development processes (Kumaraswamy, 1998). The project natures are fragmented and different parties work with interrelated participants in an ever changing construction configurations and uncertainties (Walker, 1996). In addition construction processes are intricate, parallel and dynamic, and thus more complex and vibrant than project management often visualizes. Conflicts exist in all human relations and those within the construction activities. As such the misunderstanding and deficiencies are in day-to-day life for every human being. Likewise, the conflicts in projects arise from start until completion and the highest conflict level is experienced during construction phase (Sedairy, 1994; Stanslaus, 2011). The conflict issues become more difficult during construction when specifications and plans are disposed to numerous interpretations, shortages of labors, price escalation for construction materials, amendments to the design and drawings

are foreseeable. Further, conflict issues become difficult when it is hard to anticipate and resolve all of the contingencies and deviations arising from the scope of work by the best plan and scheduling (Cheeks, 2003). So, the conflicts are inevitable and considered dysfunctional in construction projects.

If the conflict issues are not managed properly, it will result in high level of conflict that leads to frustrations and disputes due to cost overruns, delays and claims. The conflict situation depends on objectives, goals, plans, methods, and personalities that may lead to disputes in the court of law (Walker, 1996). This type of intensifying situation involves people, additional time and higher costs (Loosemore et al., 2000; Harmon, 2003). Besides the loss of time and money, it can damage relationships and affect subsequent duties and responsibilities once it proceeds to court of law. Conflicts in projects are found to be one of the features that damage project success and relationships (Walker, 1996; Fenn et al., 1997; Kumaraswamy, 1998; Loosemore et al., 2000; Harmon, 2003; Ankrah and Langford, 2005). Various conflict issues may occur and some are more inflexible and susceptible to worst situation than any others. Although conflicts cannot always be fully resolved, there are often some possibilities for conflict that can be minimized (Fenn et al., 1997). Conflicts need to be managed in order to avoid escalation and the adverse impacts on timing and quality of the work, to prevent deterioration of relationships between the project participants and to curtail the cost of conflict resolution. Therefore, the way in which the conflict issues can be structured and managed is important (Walker, 1996; Fenn et al., 1997).

1.2 Problem Statement

Many management approaches have been applied into construction to reduce conflicts. For instance, Sedairy (1994) had undertaken to resolve conflicts by application of resolution strategies in Saudi Arabian construction projects. Furthermore, Acharya (2006) had identified several factors and categories of conflicts. Acharya (2006) had measured the perceptions of conflicts from the field experienced professionals. Another research in 2011 by Stanslaus (2011) had tried to measure perceptions of owners, contractors and consultants in building projects in

Tanzania through survey. Although, previous researches might have contributed great help, conflict still occurs and it is difficult to reduce in construction projects.

The main reasons are that previous researches have not focused on conflict issues. First the previous researchers have focused on identification of causes and factors instead of conflict issues. Second, the researches had focused on conflict resolution and avoidance approaches directly in attempting to reduce conflicts (Sedairy, 1994; Stanslaus, 2011). Third, the previous research lacks clear categories for causes, factors and areas of conflicts. This means that causes and factors might be perceived as the problems rather than conflict. Moreover, the previous research has not evaluated conflict issues related to time, cost, quality, safety, scope and personnel in construction. No previous research was found to explore the evaluation of any conflict management studies relating to construction. This shows that conflict issues needs to be focused and evaluated to reduce the conflicts.

If the study of conflict issues is deliberated specifically, it will give better understanding on the conflicts in particular. This is because project participants should have a clear picture of a conflict issue when facing during construction (Thomas, 1994). Further, if conflict issues related to time, cost, quality, safety, scope and personnel in construction are evaluated separately, the conflict may be managed better and efforts to reduce them will be efficient. Because the underlying conflict issues that usually have conflicts in construction are mainly related to time, cost, quality and safety when project participants are considered as main objectives (Fenn and Gameson, 1991; Kumaraswamy, 1998). The causes and its sources can also be traced in meaningful and justifiable way if the conflict issues that occur during constructions are acknowledged specifically. So that realistic and appropriate solutions can be applied to reduce conflicts by analyzing the actual causes and its sources. Even the application of various resolution and prevention strategies can be applied in realistic manner if we have clear understanding of conflict and its underlying conflict issues. On the contrary, it may not be satisfactory to reduce conflicts by the methods of previous researches. For instance, the conflict with design changes during construction can be due to the factors and causes of design mistakes

and errors. The conflict issue is time extension due to design changes related to project time and quality concerns due to the lack of detail drawing. Moreover, all their identified causes and factors may not lead to conflicts since it revealed in general areas (Thomas, 1994). Even if so, it might have difficulties to actually recognize the real reasons for conflict without understanding the conflict issues. Without clear understanding of the actual conflict issues, it becomes difficult to reduce the conflicts. So, having witnessed its needs and limitations from previous researches, the need of new approach for evaluating conflict issues seems essential in construction to effectively reduce conflicts.

Therefore, this research is endeavored (1) to identify level of perceptions on conflict issues and (2) to evaluate the level of conflict in conflict issues related to time, cost, quality, safety, scope, personnel and others in construction. Optimistically, this research will help the public owners and contractors to comprehend the root cause of conflict issues and provide better analysis of these conflicting issues. In addition this can give clear understanding of different conflict situations before undertaking any public projects. Furthermore, this research attempts to propose solutions to reduce conflicts. Consequently, it should be an alternative approach to evaluate the conflict issues that may occur and work with proactive approach for reducing such conflicts.

1.3 Research Objectives

Based on the importance and problem statements, the main objectives of the study are:

1. To identify the level of perceptions on conflict issues in public projects from public owners and contractors
2. To evaluate the level of conflict issues in public projects from experience of public owners and contractors
3. To analyze the root causes and solutions to reduce critical conflict issues

1.4 Scope of Research

This research focuses on conflict issues in public projects due to the increasing number of conflicts faced in the construction industry. The investment on infrastructure projects and public buildings are dramatically increasing in a developing country. The recent financial crisis in the Bhutanese economy has laterally alarmed the construction industry largely mixed with other perceivable factors leading to more conflicting situations. It is also being proposed commonly in public construction project because it has the most involvement of contractors and public owners. This research was mainly studied in Thimphu and a few other places in Bhutan. This is due to the fact that Thimphu city has the highest number of public projects underway. It is also convenient in reaching to department and organizational offices. The following are the focus points of the research:

1. The study covers conflict issues between public owners and contractors in public projects.
2. Type of project includes infrastructure construction projects and the public buildings projects.
3. It focused on large contractors and project value of Nu.15M and above (>US\$2.8M).

1.5 Research Methodology

The methodology consists of several steps such as conducting literature review to collect information on conflicts and items of conflict issues in construction projects. Next the lists of items were gathered from the previous researches that are related to the conflict management in construction projects and expert opinions. Then the questionnaire and interview method was chosen for data collection for this research (Gillham, 2000). The questionnaire was pre-tested before conducting the survey by distributing it to experienced project engineers and managers as they have several years of practical experience in construction field. Their suggestions and comments were incorporated and the questionnaire was modified for the actual survey.

Subsequently, the data collection was carried out which is considered as the most crucial stage in gathering all essential information from the respondents in achieving the main objectives of the research. The nature of this research is quantitative as well as qualitative. According to de Vaus (2002), quantitative survey is regarded as most suitable for research study which attempt to collect descriptive information and actual perceptions and assessments from the respondents. A questionnaire pattern to cover the respondent's information and items for important conflicts issues and conflict level and percentage of its occurrence was developed. The data collection phase for this research was divided into three parts. In the first part, the data was collected through distribution of 100 survey questionnaires. A 5 point Likert scale (1=Strongly Disagree to 5=Strongly Agree) was adopted to identify the perception on important conflict issues. In the second part for evaluation level of conflict issues, data was collected from distribution of 60 questionnaires tentatively from the respondents. The evaluation scale ranging from level 1 (Very low=Incompatibility) to level 5 (Very high=Dispute) was developed for evaluating level of conflict issues. However, the detail explanation of scale and level of conflicts used for evaluation is explained in section 3.3.2. Furthermore, in third part, qualitative research was carried out through interview. The interview was conducted from 12 respondents to gather the opinions regarding the critical conflict issues and their experiences in the public projects. The interview basically is aimed to discover the root causes of conflict issues.

Finally, the data analysis was carried out. First, the mean scale rating of the level of agreement was used to analyze the data to obtain important conflict issues from perception. Second, independent-samples t-test analysis was performed to see whether there are significant differences between their perceptions or not. Third, the level of conflicts were obtained for each conflict issue and ranked based on the conflict levels evaluated by respondents.

1.6 Research Outline

The thesis was framed according to the chapters consisting of its specific research process and findings as follows:

Chapter 1 presents the overall importance of the research, problem statements, research objectives, scope, methodology, research benefits and outcome.

Chapter 2 presents the literature review on relevant knowledge that relates to conflict issues and its characteristics in the construction project. It reviews the current construction industry in Bhutan followed by describing in detail the scenario of conflicting situations, nature of conflicts and its types, conflict dynamics and factors that lead to conflicts in construction. The chapter concludes with the study of research gap and list of conflict issues gathered from previous research studies.

Chapter 3 describes the research methodology that covers research approach, research design, data collection method and analysis.

Chapter 4 describes about the identification of important conflict issues between public owners and contractors based on their perceptions. This chapter consists of description of the survey data and respondent's profile, perceived important conflict issues from respondents separately and determining perceived similarities and significant differences.

Chapter 5 describes the evaluating level of conflicts in public projects from public owners and contractors. It consists of description of survey data and respondent's profile for participated in part-II survey. It mainly describes about the level of conflicts in each issue evaluated by public owners and contractors.

Chapter 6 describes about the analysis of root causes of critical conflict issues and its solutions to reduce such conflicts during construction phase. It also presents

some recommendations and suggestions to public owners, contractors and concerned agencies to prevent or reduce conflicts in public projects.

Chapter 7 summarizes research findings that tie up with the main objectives of the study. Then this chapter describes the contribution of this research and presents limitations and direction for future research.

1.7 Research Outcome and Benefits

The first outcome of this research is to list the important conflict issues in Bhutanese public projects. Second outcome is the level of conflicts in public projects from public owners and contractors. The third outcome is identifying the root causes and providing solutions to reduce such conflicts during construction.

The result of this research is expected to benefit the public owners and contractors to see which conflict issues are more important in public projects. It is also expected to help them realize on what level of conflict issues and percentage of its occurrence during construction phase between public owners and contractors are predominant. Acharya (2006) stated that “Prevention is better than cure”, this research result could be used as the proactive measures while undertaking any public projects by supporting to make necessary decisions and preventive measures. This study will provide empirical evidences since the conflicts are on extreme rise in the public projects. This research is intended as the basis for the policy makers and practitioners to comprehend the facts of construction practices and the conflict issues prevailing in the Bhutanese construction industry. Thus, it is hoped that by focusing on the government as a policy maker in the industry, will provide required attention regarding conflict issues during implementation. Further it is expected that the project performers could equip with techniques and skills for effective prevention of conflicts while undertaking public projects.

CHAPTER II

LITERATURE REVIEW

Chapter one introduced the importance of conflict management in construction, problem statements, objectives, scope and presented an overview of the research outcome and benefits, outline and methodology. In support of it, this chapter provides a review of the relevant knowledge about the conflicts and its characteristics in the construction project. The first section explains about the current construction industry in Bhutan and describes on scenarios of conflict situations in construction projects. Furthermore, this chapter presents about the nature of conflicts related to types, conflict dynamics and reasons for conflict occurrence in construction projects. Then, it describes about previous researches on conflict management and derivation of items on conflict issues. This chapter is concluded by presenting the research gap and conflict prevention strategies to reduce conflicts in construction projects.

2.1 Current Construction Industry in Bhutan

Bhutan, a small Himalayan Kingdom is a developing country and landlocked between two giant countries in Asia, India and China. Bhutanese construction industry is one of the fast growing and contributing sectors to the national GDP (about 14.22%, 2010). The figure 2.1(a) presents the construction industry's contribution to GDP in the year of 2010. The high growth of the construction sector was due to the infrastructure development projects, public buildings projects and coming of mega-hydro power projects in the country. The national GDP growth rate of 8.1% in 2011 has been also observed which ranked the second in the south Asia (US Central Intelligence Agency; Annual report of the Prime Minister of Bhutan, July 2012). Moreover it has been projected by UN Economic and Survey of Asia and the Pacific that the GDP in Bhutanese context was grown at 9.8% in 2012 end. Generally the construction industry contributes to almost all economic sectors starting from building to infrastructure development such as roads and drainages, bridges, dams, water supply, sewerage and sanitation, institutional establishments including school buildings, health, residential and commercial buildings that bring developments to the

economy and advance living standards (Santosa, 2002). Instantaneously, construction industry has very significant role in the economic growth as well as creation of employment opportunities and enhancing nation's pillars of Gross National Happiness in view of achieving the indicators of social welfare and physical development.

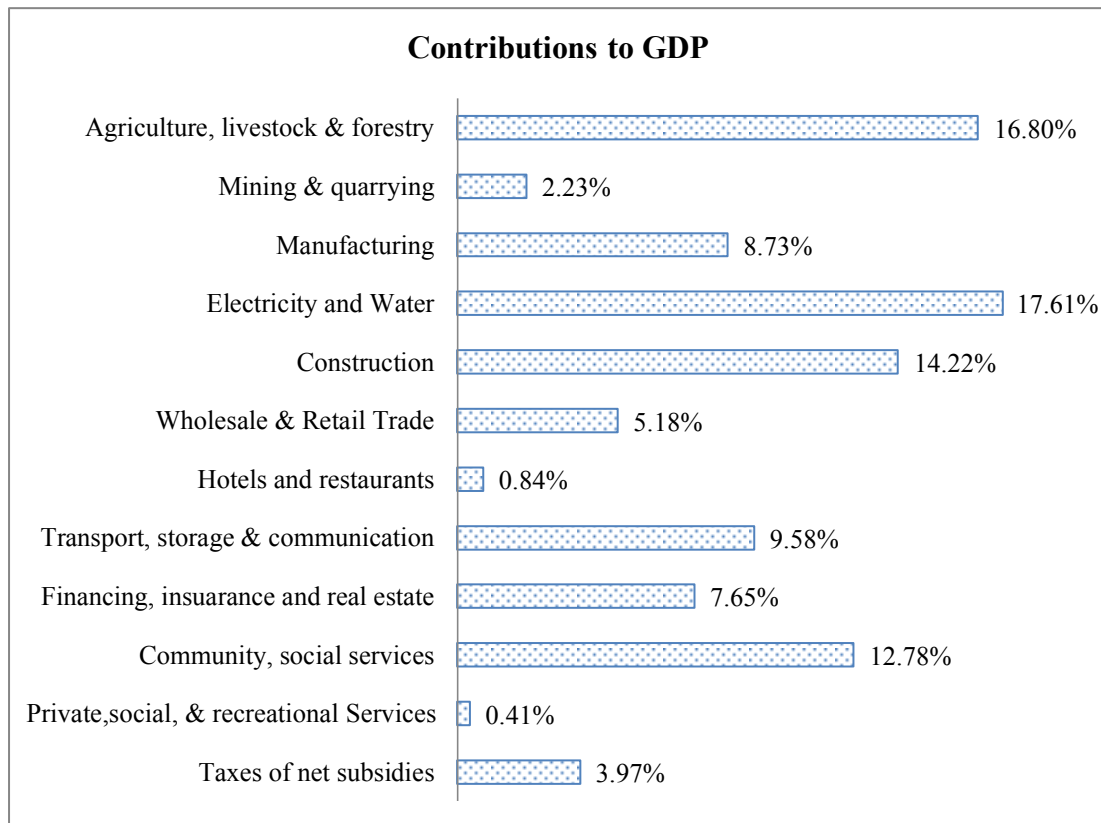


Figure 2.1(a) Contributions to GDP by Construction Industry in 2010.

(Source: National Statistical Bureau (NSB) of Bhutan, 2010)

The construction industry comprises of three categories of the companies registered under the Construction Development Board (CDB) of Bhutan. The board also controls over the registered Bhutanese architects and design consultants that mostly involve in design works of the building and infrastructure projects. As of November 2012, there were total of 2,656 registered contractors in the country in different categories such as building and infrastructure categories (roads, bridges, walls and drainages, power and telecom). They are classified as W1, W2, W3 and W4 respectively. The majority of the companies are small and few of them in the medium

category and very less in the large category including foreign entrepreneurs as reflected below in table 2.1(a).

Table 2.1(a): List of registered Contractors in Bhutan (Source: Construction Development Board, 2012)

Sl.No	Contractor/Category	Large	Medium	Small	Total
1	Local Contractors	104	356	2,196	2,656
2	Foreign Contractors	13	0	0	13
Total		117	356	2,196	2,669

The constructions in the country are dominated by the foreign construction companies especially in construction of mega hydro power projects. The other infrastructure projects are also involved by the international JV companies. These are due to the lack of capacity of local companies in terms of financial and technical to carry out the mega projects at the moment. However, the local construction companies are very important and actively involves with the country's socio-economic building and promotion of sustainable development. They undertake development program, and creation of employment opportunities and growth. The small construction companies engage in undertaking small, scattered and remotely located projects such as health centers, schools, rural roads, sanitation, housing and basic facilities which are the basic components of the development achieving the basic needs of the people. Yet, the local companies have more opportunities to participate in infrastructure development projects. These projects were initiated in the 10th FY and 11th FY Plan of the country. For instance, the unbalanced regional and urban development along with poor urban infrastructures has resulted in a shortfall of basic urban services for the people. Currently, the infrastructures like access to water, sanitation, solid waste management, and urban transport are inadequate (ADB and WB report, 2010). The important and biggest worries are the reach of water supply and shortages facing today throughout the country. Therefore, the construction sector has the challenging task to be involved in the country's demand for infrastructure development programs.

2.1.1 Current Issues of Infrastructure Projects in Bhutan

The current issues of the construction are facing unlimited difficulties to deliver professionally while implementing building and infrastructure projects in the country. Such difficulties and challenges of the construction sector are evident from the manifesto of Construction Association of Bhutan (CAB, 2011) and Construction Development Board (CDB, 2011). The biggest issues are the shortage of laborers, lack of management capabilities and most companies operate with out-dated and obsolete equipment and machineries. The lack of enough human resources and labor force in the country has already involved with large supply of low-cost foreign labors (almost 90% of foreign labors) that have filled into the construction sector. The construction has also inflicted with conflicts due to lack of capability for modern technologies and mechanization. The incapability for mechanizations and advancement are due to its drawbacks in terms of finance, technology, regulatory environment, bureaucracy, topography and poor infrastructures. Moreover, the construction industry is also intensified with problems and conflicts due to absence of comprehensive regulatory body, specific procurement and contract systems, tender evaluation standards and procedures, adequate enforcement of quality and safety, adequate practices and certified skilled workers in the country. It has enumerated that the construction industry faces numerous problems that result in time and cost overruns, substandard qualities, poor safety practices, excessive claims and disputes are common in the industry. This clearly indicates that the conflict situations have always become part of the construction projects in Bhutan.

2.1.2 Current Conflict situations of Construction

Most of the public projects are completed with extreme disagreements and dissatisfactions among public owners and constructors. The construction projects have suffered from continuing problematic situations that led to conflicts in the recent years. For instance, the construction of Thimphu Supreme Court has been the contentious project with conflicting situations. The conflicts had been started in the bidding stage of the project among the public department officials, contractors and the

people in the vicinity as well (Kuensel, 2007; High Court verdict-Bhutan, 2011). The case has been preceded to court due to unresolved issues on procurement and tender evaluation process. In addition, many other projects got completed with stressful conflicts and left unreported. Not all engineers and contractors are capable to handle project properly to reduce problems and conflicts. These are due to the lack of specific training and capacity, lack of project management ideas, negligence of the duties, attitudes and work culture. Thus, the construction continues to stumble in conflict situations. Moreover, the study of Kinley et al., (2007) revealed that projects were also completed behind schedule date of completion and cost overruns. The study found that building construction project of schools, residential/commercial and office buildings had been delayed by 54%, 31% and 43% respectively. As the result, unresolved situations and conflict issues experienced by the Bhutanese construction practitioners should be resolved.

2.2 Phenomena of Conflicts in Construction

2.2.1 Definition of conflicts

Conflict in construction project is defined as non-conformance with the procedures, techniques or a situation in which two or more people appear to be incompatible on objectives, goals and priorities (Gardiner and Simmons, 1992). It had also been perceived as disagreement and opposition between people about something relating to individual's interests, beliefs, ideas, goals and needs (Hellard, 1988). Handy (1983); Brown and Marriot (1993) have defined conflict as a situation when one person finds that the other has discouraged and becomes frustration or non-cooperative because of contradiction among objectives, priorities and accomplishment of goals.

The conflicts are perceived as unfriendly and dysfunctional but the conceptual opinions means to different persons regardless of the situations and the environment they belong. On the other hand, some perceives conflict as functional in organizational context when they can gain knowledge after experiencing and coming

out of the conflict situations. It is not unusual to talk about conflicts because the conflicts are experiencing by everyone in a day to day life. As such the conflicts are experiencing in dependencies, interaction one time or another in a situation of sharing for resources, be it in societies, communities, regions, organizations, and interpersonal relationships (Moore, 1986; Gordon, 1966). But the perceptions of conflicts alone are not enough for awareness and understanding on the whole issues of conflict situations in construction projects. Therefore, it is essential to understand that concepts and types of conflicts are related in various situations in the construction projects.

2.2.2 Types of Conflicts

Inter-group, Interpersonal and Intrapersonal Conflicts

Generally, the conflicts are categories into three different types such as inter-group, interpersonal and intrapersonal which are leveled into organization, group and individual (Simmons and Peterson, 2000; Jackson et al., 2008) as shown figure 2.2(a). An intra-organization conflict is the conflicts that occur within an organization due to the differences of internal working functions in both dimensions. The conflict could occur between any persons in the organizations when work involves task interdependency but the conflict between managers and subordinates is viewed as vertical dimension and the conflict is viewed as horizontal dimension when occurs between departments or workgroups. If the conflict occurs between two or more organizations, then it is perceived as inter-organization conflict.

The intrapersonal conflict is the conflict occurring within one self (Jackson et.al, 2008). This may occur when one feels that requirements are against own values and respect. This may also occur when one feels of unfair treatment and acted against the will. As a result it suffers from internal stress and tensions. The reason for such intrapersonal conflict could be due to contradictory habits in socialization, personal needs and attitudes whereas the intergroup conflicts are the conflicts that occur between two or more groups for group works. The conflict can start right from the time of getting together while forming group for doing task and fulfilling group's

goal. Therefore, interpersonal conflict occurs when two or more people have differences in their views to meet their goals and objectives. Such interpersonal conflict can also occur when there are differences in work styles and timing.

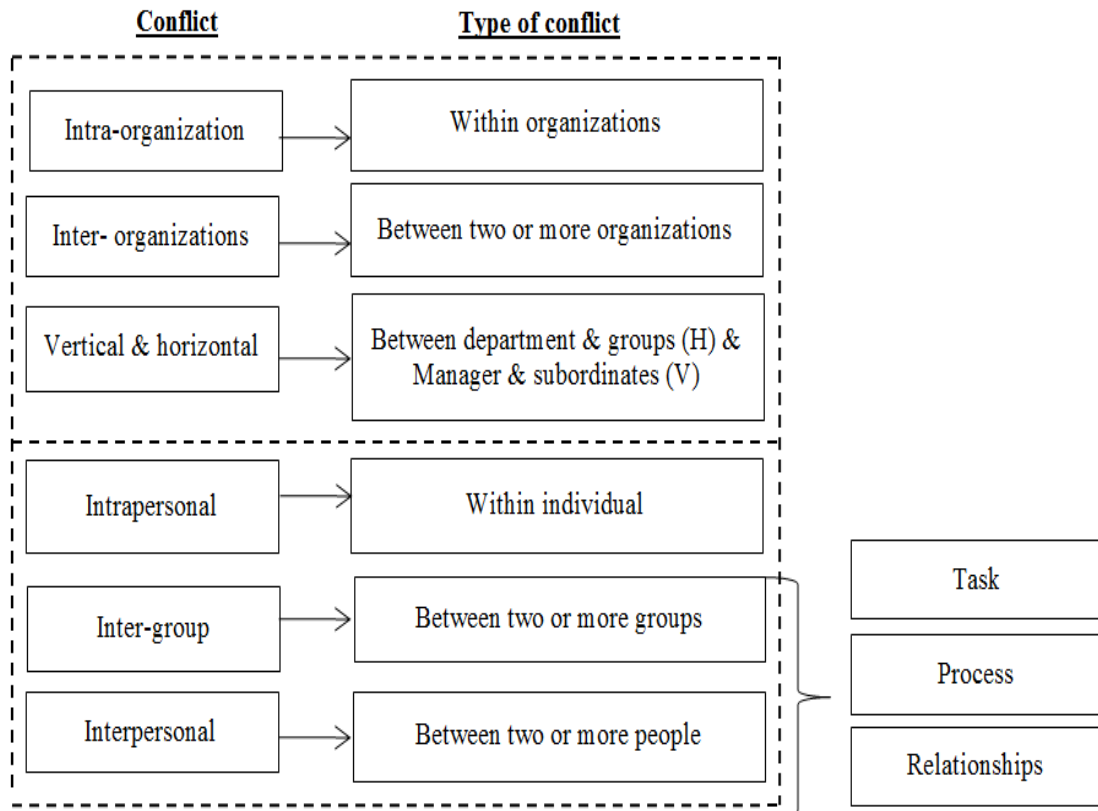


Figure 2.2(a): Levels and types of Conflict, Source: Moore (1986); Gordon (1966); Jackson et al., (2008); Simmons and Peterson (2000).

2.2.3 Differences between Risk, Conflict, Claim and Dispute

The terms of risk, conflict, claim and dispute referred to construction are quite confusing and sometimes perceived as similar and overlapping meaning. However there are some basic differences between them in the construction (Acharya, Leehas, Im, 2006) as shown in the figure 2.2(b).

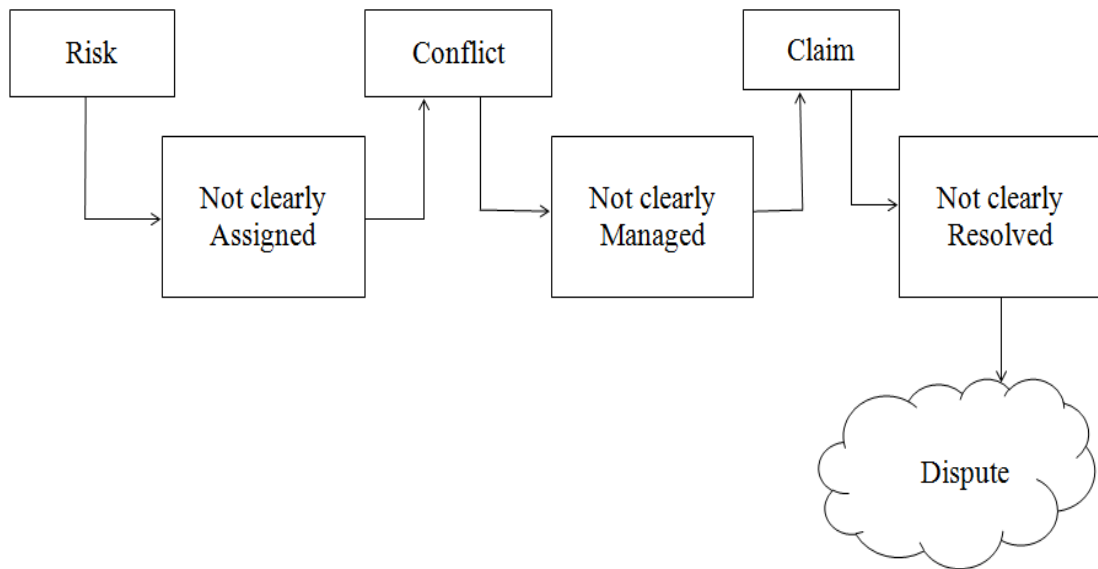


Figure2.2 (b): Difference between Risk, Conflict, Claim and Dispute

Source: (Acharya, Leehas, Im, 2006)

According to McCallum (2000), the risk means the occurrence of uncertain events that might bring possible damages or lost to the projects whereas problems are defined as unidentified risks and can be occurred at any point of project time. The solving problem in project is needed to control and managed the project. But unsolved problems can lead to the conflict since it affects the other persons who involve with the project. Usually, conflict in the projects starts with the unsolved problems that can face between two or more people. Even though, conflicts and disputes have different meaning but people generally perceives as the same and still have unclear idea (Fenn et al., 1997). The instant result of increasing conflict issues can lead to claims and high level of conflict. The claim is usually the fight for hindrances and compensation of time and cost for being affected by other parts. The claims related to loss of time and cost will become a dispute if not resolved adequately on time and satisfy the party. These are the situations where the intensity of conflicts is relatively high as indicated in figure 2.2(c) of conflict curve.

The dispute is the situation when either of a party feels satisfaction over claims and entitlements. The conflict issues related to objectives will be at the highest stakes or conflict level during dispute situation. It becomes like do-and-die situation,

and behaviors will be uncontrollable and do not care about the relationship. As a result, the party reaches in a situation where they have only the rights to win over the battles. Under a disputed situation, a disputed party will intend that nothing will solve the issue other than just the court of law that exists. Therefore, the dispute is allied with justifiable subjects and requires resolutions. Unlike conflicts at low level, disputes are hard to be managed and it has to lend the intervention of third parties. The third parties can be arbitrator, mediator, and court etc. for the dispute resolution (Barrie and Paulson, 1992). Therefore it requires to be resolved by arbitration, litigation and other dispute resolution techniques such as ADR (Alternate Dispute Resolution Technique).

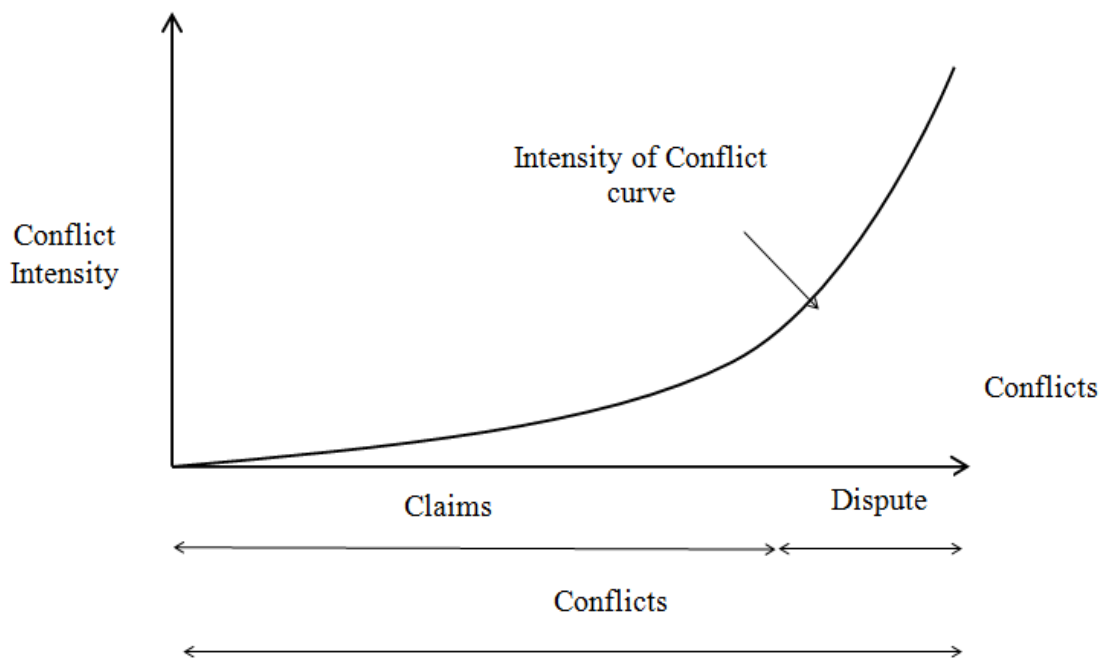


Figure 2.2(c): Intensity of Conflict Curve (source: Yates and Hardcastel, 2003)

Furthermore, the definitions of conflicts, claims and disputes have been combined into spectrums of conflicts based on the intensity and time (Yates and Hard castel, 2003). As shown above in the figure 2.2(c), the range of the spectrum begins with the observation of claims and dispute on the extreme side. It also conveyed us that the level or the intensity of conflict increases with time over the projects. It also involves with different people interacting and sharing resources as the progress or the

stakes are relatively high. The conflicts at the beginning are usually at low level, but increases over time when the situation is lack of requirements, non-compliance and failure on one side, disagreements, misunderstanding, frustrations and breakdown of relationships between parties as shown in figure 2.2(d). The conflict levels are momentarily gain strength with the issues and sensation of claims over time and cost for compensation of one's deviation or failure. Successively the unmanaged conflicts can reach the highest level (i.e. disputes) which could involve third party intervention and lawsuits.

From figure 2.2(d), it can be understood that the conflicts are developed precipitately with incompatibility over tasks, process or methods while undertaking the projects. However, the projects start with incompatibility from both the parties with uncertain issues or undertook risk for taking the task without actually foresees the conflicts. The very low level of conflicts carried over to the next stage inflicts with disagreements between the parties. The situation becomes unfavorable on both sides when they can observe the defects in the works, the task performed doesn't comply with the intended requirements. The situation further aggravates when one observes contradictory in performance with the works being deviated from the original scope of works incurring additional cost and time. The variations could have occurred due to several factors in the construction projects, however if the reasons do not support with evidential case to resolve claims, the frustrated parties lead to disputes requiring justifiable issues. The dispute usually involves third party intervention for arbitration, otherwise the intensified situation faces in the court as already noticed in the earlier descriptions.

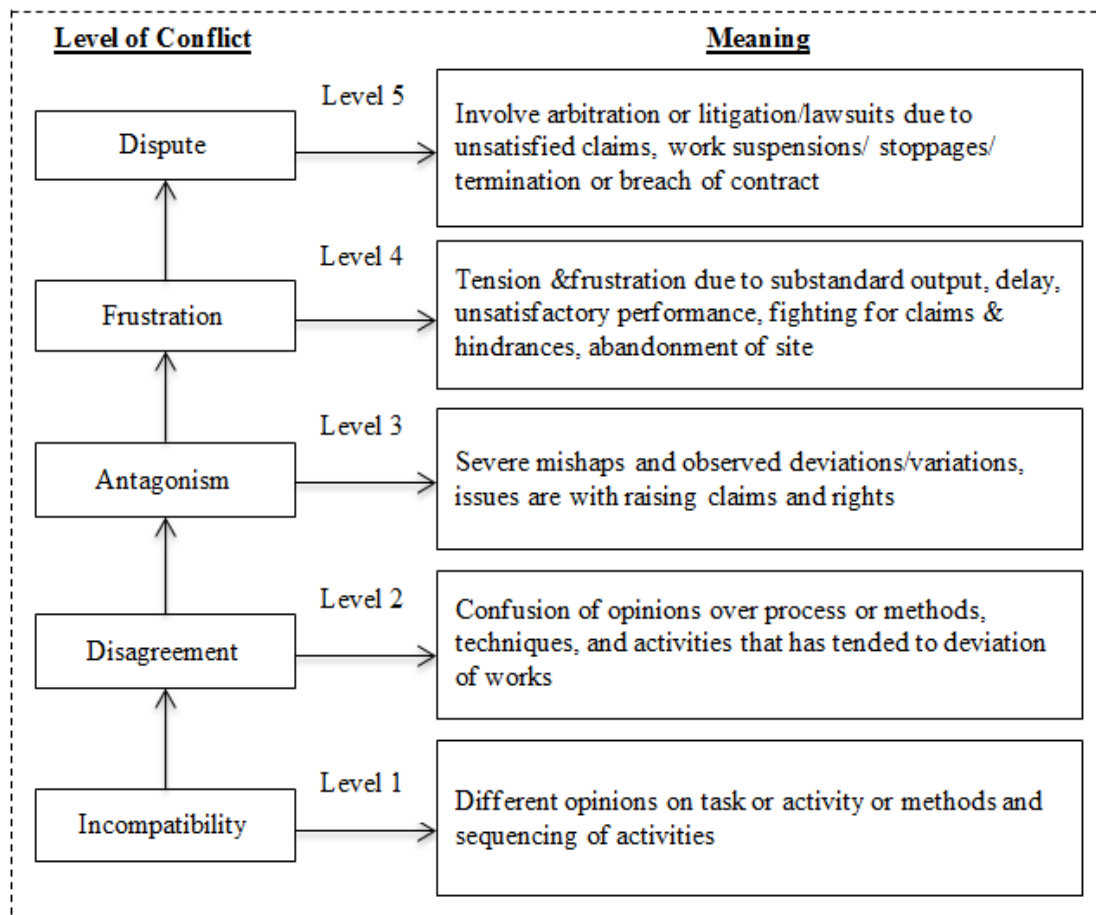


Figure 2.2(d): Conflict Level in construction projects (Source: Handy, 1983; Gardiner and Simmons, 1992; Brown and Marriot, 1993; Hellard, 1998)

2.3 Dynamic Conflict in Construction Projects

2.3.1 Conflict Curve

The conflict means to different people's opinion and perceptibly varied among different backgrounds and professionals. The differences in opinions are due to the scenarios of perceptibility and incredible effect in economic, social and political situations. However, the conflict process involves psychological perception of conflicts over time in any work situations (Groton, 1997). The three stages of conflict cycle curves are shown in Figure 2.6. These are (1) escalation, (2) climax and stalemate and (3) conflict de-escalation (Rubin, 1993; Jong and Han, 2003).

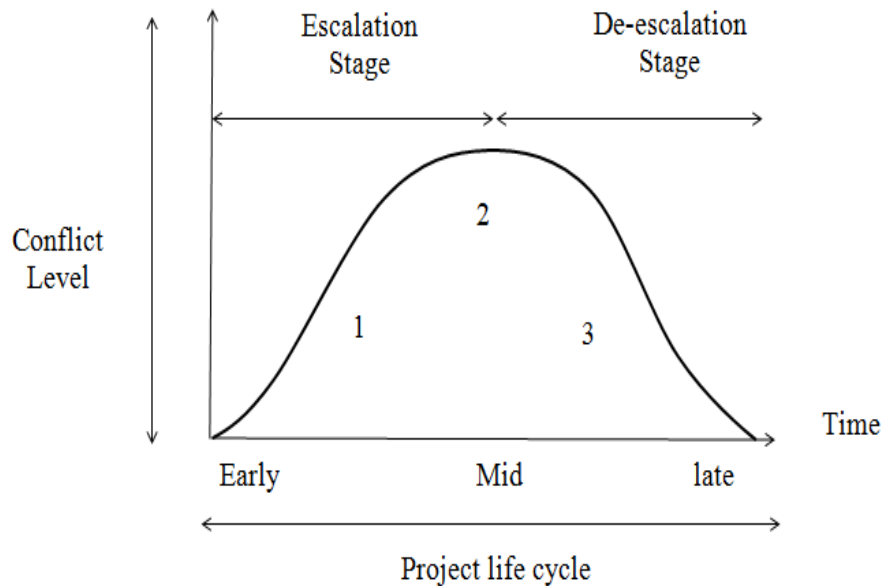


Figure 2.3(a): Conflict Curve (Source Groton, 1997)

The conflict escalates with certain issues related to project priorities, goals and objectives etc. and it reaches a highest peak, which is the intensified situation. In this peak situation, participants come to a stalemate at point 2 as shown in Figure 2.3(a). At this situation, participants tend to be either in win-win or do-die situation, either assertive or cooperative behavior can be exhibited by both parties requiring the effective management strategy. If the conflicts at this high peak point are being managed, the curves will move downward to the settlement. At this point the engineer or manager are required to be highly skillful in handling conflict, otherwise the curve would further stretch upwards reaching to litigation stage. As the conflicting situations are inevitable in construction projects, the concept of dynamic conflict can be explained more in the subsequent sections.

2.3.2 Pondy's stage of conflict development model

This section describes about the conflict model and it is important to understand its development process. The development processes are viewed as sequential process because the frequency of its occurrences at different times can be perceived in the series of events or stages at different levels (Hodge and Anthony, 2002; Pondy, 1967; Rahim, 1986). It consists of five stages as shown in figure 2.3(b)

below: 1) Latent conflict, 2) Perceived conflict, 3) Felt conflict, 4) Manifest conflict and 5) Conflict Aftermath.

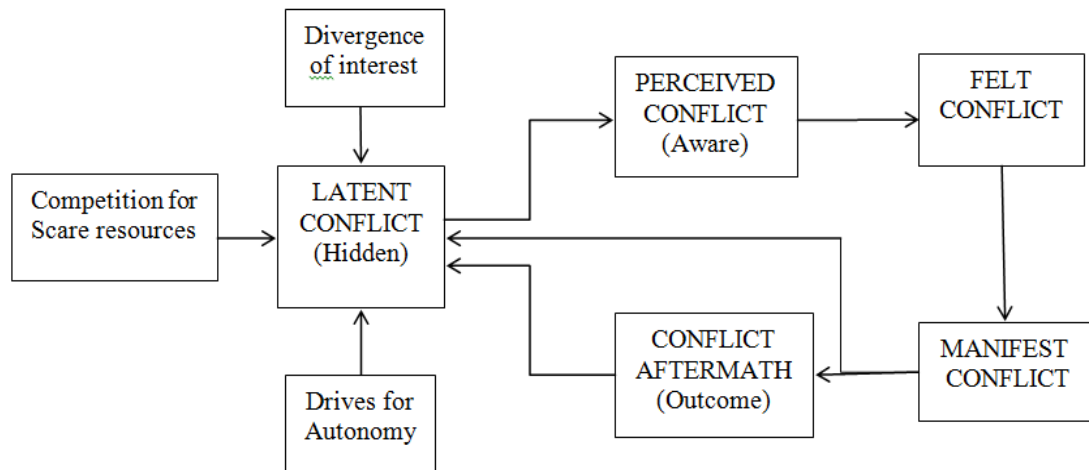


Figure 2.3(b): Pondy's Stages of Conflict Model (Source: Pondy, 1967)

1. **Latent Conflict:** This is the situation in construction project that conflicts remain hidden where no one actually identify. Normally it refers to the sources of conflicts in a situation when roles and duties undergo participating in competition of scarce resources. However, it assumes that the conflict ought to occur any time due to antecedent conditions.
2. **Perceived Conflict:** This is the situation in construction project that the conflict starts to identify. For example in construction project, a situation when party thinks the conflict actually presents but don't actually react with any behavioral actions. The party just perceives the scenarios of conflict situations but they don't react to it, because the influence at that situation might be very less and has not affected the other party.
3. **Felt Conflict:** This is the situation where perceived conflict is becoming worst and the both parties are starting to suffer with stress and tensions but neither would react to it.

4. ***Manifest Conflict:*** Both parties can actually detect and understand the conflict and they begin to demonstrate the conflict behavior in an openly of aggressive performances and in such situation they look for the rights and tend to go violent if the issues cannot be resolved.
5. ***Conflict Aftermath:*** Following the situation of manifest conflict is the outcome of conflict that may cause new seeds of conflict and involve change. The aftermath of satisfaction can be observed if the conflict situations had been resolved earlier among the participants, or else could lead to situation of earlier level of conflict that seems to have satisfactory resolution.

2.4 Overview of Conflicts in Construction Project

The section describes about the nature of conflict, causes and issues in construction project. It aims to provide the background of conflict in construction project.

2.4.1 Nature of Conflicts in Construction Projects

This section presents about the nature of conflicts in construction projects. The fragmented structure of construction industry with different categories of organizations such as construction, design consultant, suppliers, owner organization and other related dependencies etc. are the main sources and reasons of conflicts in construction. As such the conflicts in construction projects are being originated from the industry itself (Hellard, 1987). The reasons are due to project nature such as the uncertainty nature, complexity of project, procurement and contract types and methods, design, construction plans and methods, environment etc. (Fenn et al., 1997; Kumaraswamy, 1998; Loosemore et al., 2000).

The project nature itself can create conflict situations in construction projects when many things are different within project itself and project involves with different people with varied goals and objectives, different source of funds, designers,

suppliers, crew members, different personalities etc. (Walker, 1996). The changes are obvious in due course of fulfilling their objectives (Cheeks, 2003). One can be the reasons of project delays caused by several factors. Whatever or whom one must blame for a conflict due to delay regards to time issues, the culprit for the cause of delay either can be occurred due to the owner, contractor, designer, suppliers, and default on crew member's part or whoever. The issue remains alive with the incompatibility and disagreements over time. In addition the perception of quality is different to different parties. The client may describe the quality inadequately and prepare specifications without clear meaning. The high quality may mean different things among labor, project manager or engineer. This creates more confusion among teams which is mainly due to lack of having specific standards to define materials and workmanship in the projects. Without clear and definite description about what one requires and what need to be carried out at construction site, it keeps more issues of conflict related to quality as well as time. As money is typically linked to quality, sometimes a contractor may misunderstand the requirements and quote substantially lower price than other bidders in order to win the project. Likewise the conflict in construction projects seems to occur always as part of occurrence in construction project. Therefore the causes of conflicts in construction projects are presented in the next section.

2.4.2 Causes of Conflicts in Construction Projects

This section describes about the causes of conflicts by different project participants and other projects related matters and externalities. The main participants in the projects are owners, contractors and designers. The participants are like being entered into a business competition. They involved in project with their own unique goals and objectives and all of their objectives have to be depended on each other. All of the participants have to come across number of regulations, guidelines, specifications, contractual agreements, construction process, task dependency and relationships etc. As such every owner wants to complete the structure within time and at reasonable cost. On the other side the contractor wants to complete within minimum cost (below contract value) as far as possible and handover to the owner.

Of course, the designers pay concern to their creative designs, but even designer try to complete as soon as possible and move to new projects. As a result, it becomes the part of negligence and leads to design errors creating space for conflicts in construction projects. Some of the main causes of conflicts by different participants are presented in the subsequent sections that were collected from literature reviews. Basically, the root causes of conflicts are (Fenn et al., 1997; Kumaraswamy, 1998): (i) Lack of proper communication between participants, (ii) Without clear objectives and goals, (iii) Different personalities, moral beliefs, ethics, values, egos, (iv) Varied interest and opinions, (v) Scarce resources, (vi) Failure to comply regulations, (vii) Poor workmanships and Performance, (viii) Unreliable documents and poor documentation, (ix) Poor project plans, planning and coordination and (x) Characteristic and capability of person (failure to do their work accurately, efficiently and in timely manner, express themselves clearly and failure to understand the implication of orders, instructions etc.). The causes of conflicts during construction can be shown in figure 2.4(a) below.

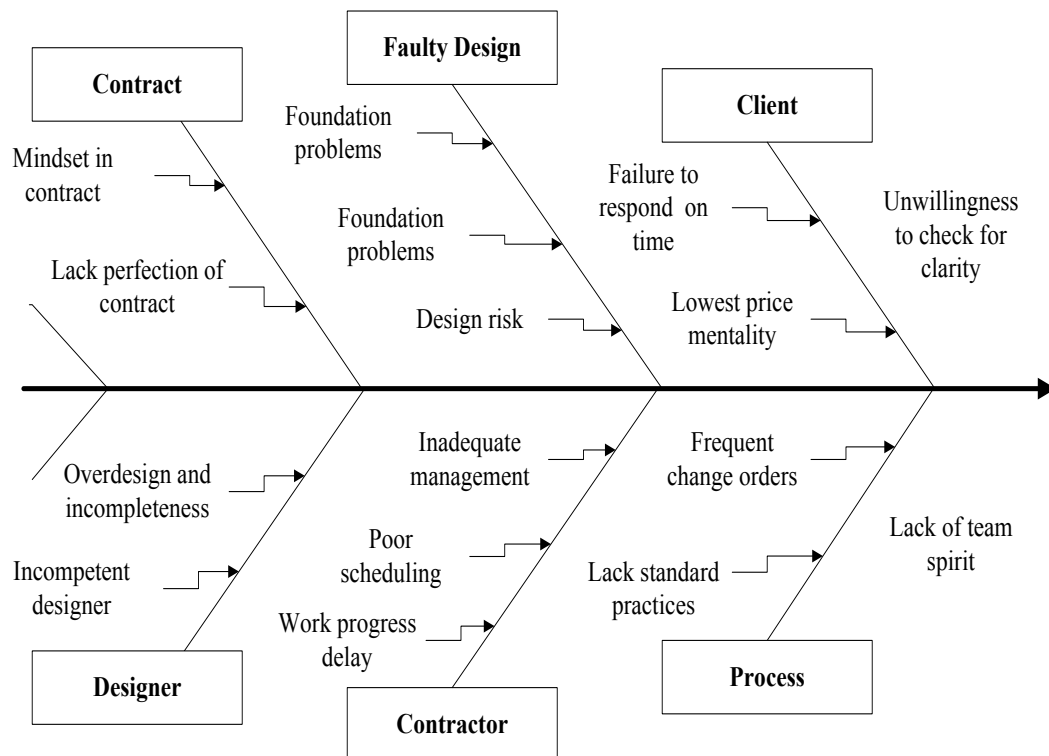


Figure: 2.4(a) Fishbone diagram representing causes of conflicts (Mosta, 2006).

2.4.3 Conflict Issues in Construction Projects

The conflict issue can be defined as the matter or point in interrogation or argument, or unsettled point or matter under discussion or over which there are contradiction or opposing or disagreements between parties (PMBOK). On the other hands, the factor or risk is an event or something that might occur and impact the project in future but the issue is something that is impacting the project now (Yusuwan, 2008). If factors and risks are sure to occur, then it is going to be an issue and not risk or problems (Wood, 2003). In addition if factor or risk has already occurred, then it is an issue and possibly a catastrophe (Zaini and Takim, 2011). So if the factor, causes or risks are left unidentified, it will have lots of issues because events will occur and people involved will have different positions and requirements on what to do, resulting in an issue. If the events are accurately identified as risk or factor, then there will have approved response plan and the issue may be less. But the issues always occur to projects no matter how risk or factors are identified (Wood, 2003; Yusuwan, 2008).

In construction project, the project objectives are generally understood by both owner and contractor. Both parties try to achieve the project objectives; however, the nature of project is fragmented into several work packages or subsystems. Therefore, parties may not realize the conflict issues that may occur during construction phase. In addition the conflict situations that occur during construction can be seen as specific issues related to time, cost, quality and safety.

During the construction phase, the conflict issues normally occur when the projects cannot meet the project objectives such as schedule time, projected cost, quality and safety. Each specific issue is the main thing in construction project that should be achieved by both parties. Moreover each issue is interrelated each other in a project. For example, the meeting with design error during time of construction would be the conflict issues related to time as well as cost and quality. Failing to timely prepare and submit modified drawings would affect the normal scheduling and quantity calculation for payment due to drawing revision. In addition, the hindrance to

the normal progress of the work in which long waiting time for drawing changes would affect subsequent activities affecting the qualities due to rework and non-continuity of work. In the process, each participant habitually ends up in a situation of blaming game culture, trying to safeguard and gain in favor of their required objectives.

Due to the nature of construction project, conflict issues are always going to occur between project participants especially between owner and contractors during construction phase (Carmichael, 2002). This was also supported by the previous researches on conflict management in public projects in Saudi Arabia (Sedairy, 1994) and Tanzanian construction industry (Stanslaus, 2011). Both studies revealed that conflict mostly occur during construction phase with frequency of 76% and seriousness of 74% and the conflict between owner and the contractor has the most serious (60%).

Therefore, it required high attention to manage the conflict issues during this phase by both parties since this construction phase has observed to have the high frequency of occurrence and highest conflict level. The effective solution to reduce conflict situations right from the start of the project is seen to be a must. At the initial period, the project seems to have minor frequency and seriousness during design and predesigned phase. During that time, conflicts seem unknown and even if existed, the occurrences might be very less significant, but the conflicts have gain momentum over the project period (Kumaraswamy, 1998; Hellard, 1987). In the event of such situations, the conflict issues are not resolved properly by both parties, the escalation of conflicts can lead to the worst scenario having the highest conflict level. In the worst scenario, high conflict level includes unsatisfied claims and disputes eventually that lead to litigation and lawsuits as shown in figure 2.4(b).

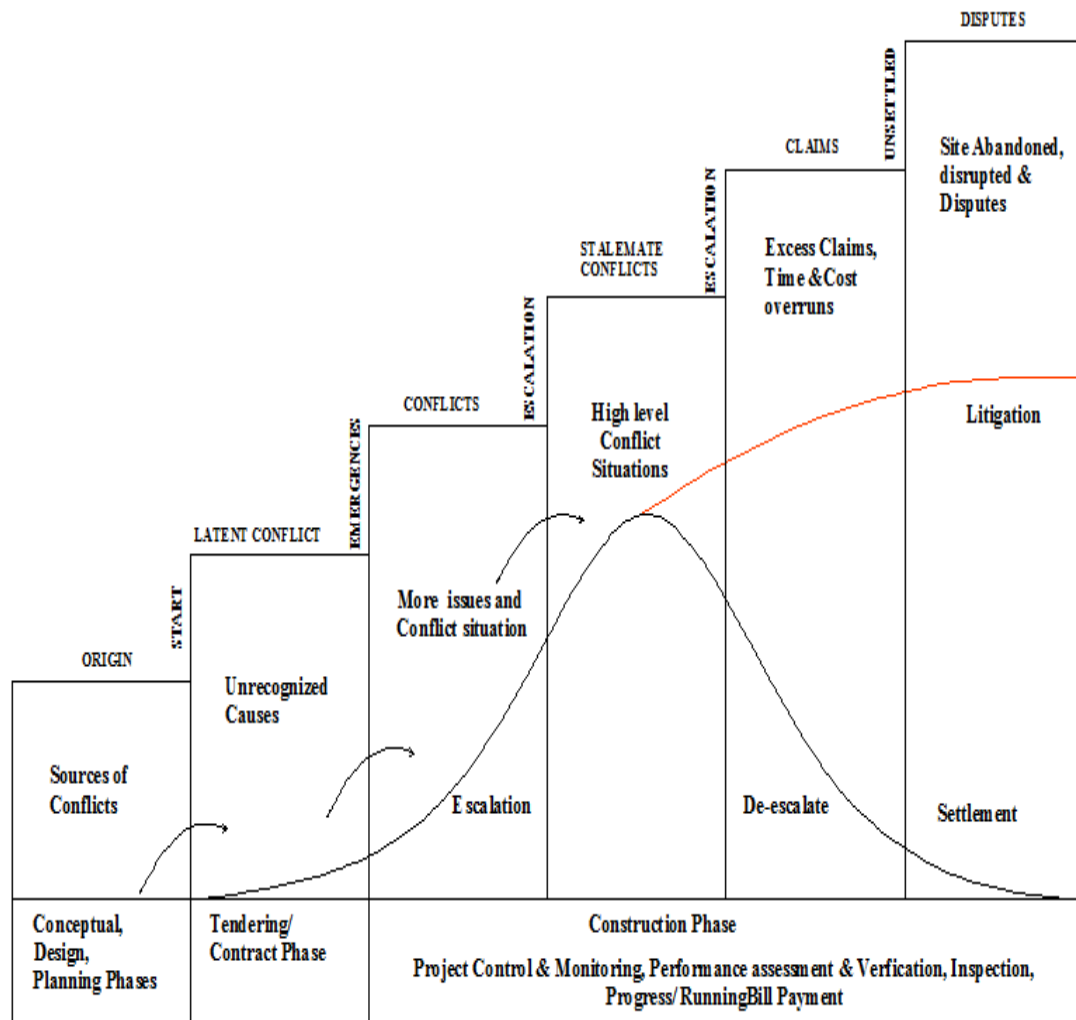


Figure 2.4(b): Conflict Situations at project life cycle
 (Source: Pondy, 1967, Groton, 1997; Pena-Mora et. al, 2002)

2.5 Previous Research on Conflict Management

The previous researches have explored various causes and factors of conflicts and management strategies in construction projects. These construction conflict factors and management approaches had studied by many researchers such as Kumaraswamy (1997), Fenn (1997), Yogeswaran (1996), Carmichael (2002) and Acharya (2006). In particular, the research has been conducted in Korea, Saudi Arabia and Tanzanian construction industry. The Korean perspectives and Tanzanian study has similar findings, however they have different approaches. The brief overviews of their research theme are given in next section as shown in figure 2.5(a). The previous

researches are classified into three groups such as (1) identifying causes of conflicts, (2) conflict resolution and (3) conflict prevention.

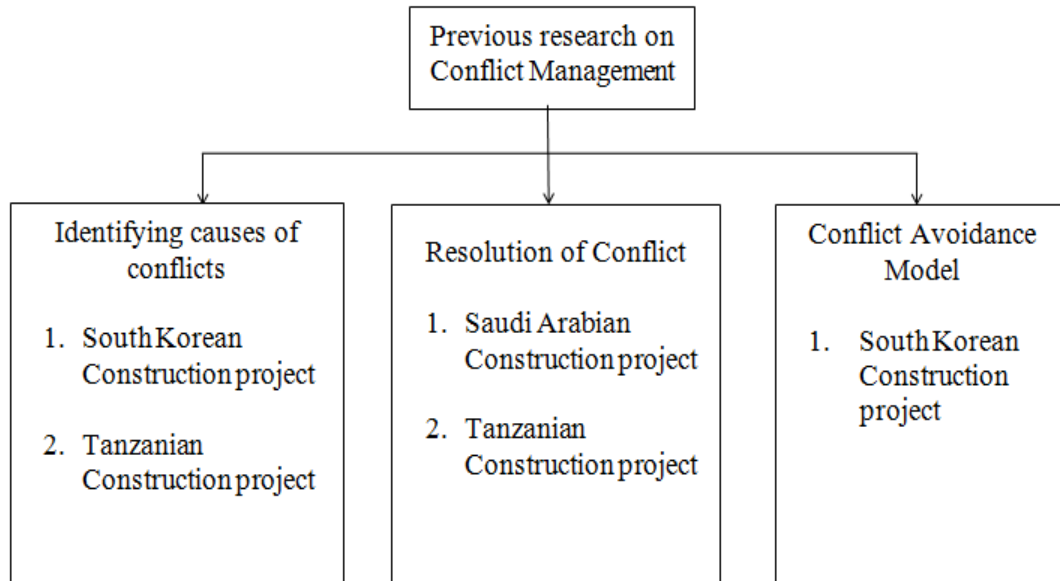


Figure 2.5 (a): Previous research theme on Conflict Management

(Source: Sedairy, 1994; Acharya, 2006; Stanslaus, 2011)

2.5.1. Identifying Causes and Factors of conflicts

This section gives the explanation of previous researches on identification of causes of conflicts in construction in trying to reduce conflicts. First, the study has been conducted at Tanzanian construction industry (Stanslaus, 2011) and they have identified 11 areas of conflict factors. The study has focused on the occurrences of conflicts in different phases of construction project life cycle, between project participant's relationships within the project teams. Data had been collected by means of both quantitative and qualitative approaches from 121 respondents out of 300 they distributed to client/financier, general contractor, specialist contractors, architects, engineers and quantity surveyor. The eleven areas of conflicts found from their case studies in construction industry are such as: (1) Design errors, (2) Contractual claims, (3) Multiple meaning of specifications, (4) Delay in payments, (5) Poor communication, (6) Excessive contract variations, (7) Difference in evaluation, (8) Differing site conditions and limitations, (9) Errors in project documents, (10) Public

interruptions and (11) Cultural difference. These 11 areas of conflict factors have been further enumerated with the causes gathered from their case studies. They have revealed in total of 50 causes of conflicts in construction projects in different areas of conflicts as shown in table 2.5(a).

Table 2.5 (a): Areas of conflicts and their possible causes in public building projects in Tanzania (Source: Stanslaus, 2011)

Areas of conflicts identified	Possible causes
1. Design errors	1. Clients requirement misinterpreted by designers 2. Designer's inexperience 3. Designer's incompetency 4. Design time inadequacy 5. Wrong design data 6. Low cost designer
2. Contractual claims	7. Unfinished tender documents 8. Insufficient contract documents 9. Unrealistic tender price by contractors 10. Poor contract administration
3. Multiple meanings of specifications	11. Carelessness 12. Specification poorly written 13. Cut and paste style 14. Use of outdated specifications
4. Delays in payments	15. Lack of fund 16. Poor financial projection by client's 17. More claims by contractors 18. Late payment and long process of payment by client 19. Late evaluation by consultant for contractor's claim 20. No contract clause provisions for enforcement of timely payments
5. Poor communication	21. Lack of communication procedures 22. In effective means of communication 23. Negligence
6. Excessive variations	24. Change of scope of works by the client 25. Change of scope of works due to design errors 26. Errors in BOQ 27. Drawings errors 28. Specifications errors 29. Misinterpretation of contract information
7. Differences in evaluation	30. Unclear method of pricing the contract 31. Tendency of contractors claiming high prices 32. Dubious claims made by contractors 33. Tendency of consultants / clients under valuing

	contractor's claims 34. Profit making or loss balancing approach of the contractors by using inferior items in lieu of the ones specified in the contract
8. Differing site conditions and limitations	35. Lack of money, time, experts to conduct site investigation 36. Wrong interpretation of site investigation 37. Ignorance of client and consultants on the importance of site investigation 38. Lack of necessary building permit from regulatory authority
9. Errors in project documents	39. Inadequate time for preparation of documents 40. Incompetent personnel in preparation of project documents 41. Inexperience of personnel involved in preparation of documents 42. Low consultancy fee 43. Negligence
10. Public interruption	44. The project involves displacement of people 45. Unfair compensation for displaced people 46. Poor public relationship between the project people and the public 47. Non adherence to public authorities regulations
11. Cultural differences	48. Language problem 49. Working norms problem 50. Professional culture problem

The result is based on their mean value criterion in which the delay in payment area was the first ranked. The reasons for delay in payments as reflected are lack of funds, long procedures for payment, and poor financial projection from client side. Contractual claims and excessive variations were ranked in the second and third areas of conflict, in which time extension period and claims were the main causes. Accordingly, the study has revealed difference in evaluation and poor communication in the fourth and fifth rank whereas the conflict area in design errors was observed only in the sixth place. This shows that the designer's experiences and competency are not the serious case that arise conflicts in construction. However, the causes of conflict due to cheap design hired cost, inadequate design briefing and limited time for design are the main reasons for conflicts between designer and owner during design phase only. Their study revealed that construction phase has the highest intensity of conflicts more than 55% comparing to other phases. During the

construction phase, contract variations and design errors have resulted in the highest intensity of conflict area and the conflicts was mostly noticed between the owner, contractor and the designer. The main conflict area during construction phase has noticed between owner and contractors were claims, late payments and variations having mean score value of 3.91, 3.13 and 2.69 respectively.

Another study conducted by Acharya, Leehas, Im (2006) had identified the critical factors of conflicts in Korean construction industry. The study has revealed six categories of conflicts based on participant's activities and 43 factors of conflicts. They have collected data from 124 professionals of owners, contractors and consultants working at different construction projects. Their study was descriptive and dealt with identifying the critical conflicting factors within building and civil engineering construction projects in Korean context. The six categories of critical construction conflicting factors in Korean perspectives are (1) Change of construction site conditions, (2) Evaluation of change order, (3) Design mistakes, (4) Quantity variations, (5) More meanings in specifications and (6) Public interruptions.

Their research has been analyzed using AHP method to measure the weight of the conflict factors and they have interpreted in hierarchical integrated levels. The researcher has categorized the criteria of conflicts and each criterion has subdivided into causes. The factors such as change of site conditions (24.1), interruptions from public (22.5), evaluation of change order (21.0), design errors (17.1) excessive variations in quantities (8.2) and specification problems (7.1) have been observed as the critical factors having more effect on Korean construction projects.

Their study by Acharya, Leehas, Im (2006) found that owner having 42% was the most accountable party for construction conflicting factors among other factors especially for change in site conditions. In overall, the owner has been noticed as the most responsible person for conflicts with 35.6% followed by consultant with 34.2% and the contractor with 17.6%. Although, the study does not explain about the relationship between project participants, it is assumed that the conflicts occur mostly between owner and contractors during construction phase. Since they are the main

players during construction and noticeably they have observed high conflicts in change of site conditions. The conflicts due to change of site conditions could be due to subsurface conditions, near water table, unexpected archeological things encounter at site etc. (Acharya, Leehas and Im 2006).

Furthermore, this section describes the brief explanation on another research that has been explored on management of conflict in public construction sector in Saudi Arabia (Sedairy, 1994). The research has highlighted on the occurrences of conflicts in public projects based on the perceptions of participants. The result of the study has been obtained after analysis of 138 questionnaires distributed to government agencies, contractors and consultants in Saudi Arabia. The study has also revealed that conflicts occur mostly during the construction phase between the owner and contractors, and contractor and the consultant. The reasons for conflicts were due to the project priorities, objectives, and different perceptions rather finding the conflict issues from technical or management context related to objectives. In addition the sources of conflicts were project time, cost, concepts and specifications which have broader perspectives. Basically, the study has been conducted to identify the relationships of variables at different phases of project life cycle. The study also have identified conflicts between participants and measured the frequencies and seriousness. First, the conflict sources and causes for their study are given below in table 2.5 (b).

Table 2.5 (b): Source and causes of conflicts in Saudi Arabia public projects (Source: Sedairy, 1994)

Sources of conflict	Causes / areas of conflict
<ul style="list-style-type: none"> • Project concepts • Project cost • Project time • Contract • Specifications 	<ul style="list-style-type: none"> • People's perception • Project goals and objectives • Cultural difference or orientation • Understanding level • Priorities

The study has found that the contractor faces the most frequent (66%) conflicts with the client and consultant. In particular, the conflict between contractor

and consultant has observed to have the most common conflicts but the conflicts between client and the contractor has the most serious (60%). This result has been analyzed based on the significance level of 95% confidence on chi-square analysis. Similarly, the research has centered on why the conflicts occur and at what stage of the project does it occur. In addition, they have discovered that the conflict does occur mostly during construction phase with frequency of 76% and seriousness of 74%. The least occurrence of conflicts has noticed during pre-design phase (44% and 45%) among the other phases of design (57% and 59%) and post construction (56% and 56%). Both the frequency and seriousness of conflicts have been dominated by the difference in project priorities (a cause) and project time (a source) and project priorities and goals with the cost as the second ranking. The relationship between project time and the cultural difference has been observed not so important in their study.

However, we can observe from the study that the project cost is the most predominant issues of conflicts in construction projects. The limitations observed from the study is that lack of specific issues on conflict however, they mentioned about the time, cost, specifications and so on. The query is that how to quantify the real issues of conflict related to time, cost and other parameters as they mentioned. Even though, the seriousness and frequency are determined but how do they actually assume the conflict issues to make judgment reliably and consistently respect to project priorities and goals.

Although, previous researches has identified the causes and categories of conflicts and tried to propose management strategies to reduce conflicts. But it may not be satisfactory to reduce conflicts just by identifying the conflict causes without understanding the issues that led to conflicts. Moreover, all causes may not lead to conflicts since it revealed in general areas in all the previous researches. Therefore, conflict issues should be evaluated in order to effectively reduce conflicts in construction, so that even further resolution and avoidance strategies can be applied meaningfully and realistically.

2.5.2 Conflict Resolution Approaches

This section gives explanation about the conflict resolution being applied in construction industry to have manage the escalation of conflicts that has been studied by many researchers (Thomas and Kilmann, 1976; Rahim, 1986; Boulding, 1962; Putnam and Wilson, 1982; Mastenbrook, 1991; Lippit, 1982). The approaches are basically compromising; confronting, withdrawing, forcing and accommodating most common practice in construction. Different researchers have use different meanings on the approaches based on their situation and applicability derived on different perceptions as shown in table 2.5(b). However the meanings are synonymous regardless of the approaches it based and the basic definitions of five main resolution approaches are:

Five Conflict Resolution Approaches

- (i) *Collaboration*: It is also called *problem-solving, integrating, confronting or win-win style*. It is the situation when conflicting participants meet face-to-face and trying to collaborate and agree each other that can satisfy the concerns and issues on both sides. Trust each other and try to solve the problems with open and direct communications.
- (ii) *Compromising*: It is like give and take style. The conflicting parties argue each other and finally *negotiate* to arrive at mutually acceptable decision and get equal satisfaction. Such situation occurs when parties don't want to break relationship and suffer lost in a limited time.
- (iii) *Accommodating*: It is *smoothing or supportive* style. Both parties give important in agreement or cooperation and sacrifice one's concern for other party and letting them satisfy. Such approaches are applied when one want to gain time and create understanding since the liability are less.
- (iv) *Forcing*: It is style of *dominating, competing or controlling* and wanted to win everything and forget the other's concern. It is 'do and die' situation when stakes are high and thinking the relationship is not important. The conflict level is extremely high and results in win-lose situation.

- (v) *Avoiding*: This is in situation when one thinks to *postpone* the issue or want to *withdraw* from it. They think that the conflict will go away or want to gain time and keep neutrality and reputation. The reasons could be the stakes are low or not prepare to bargain even if stakes are high.

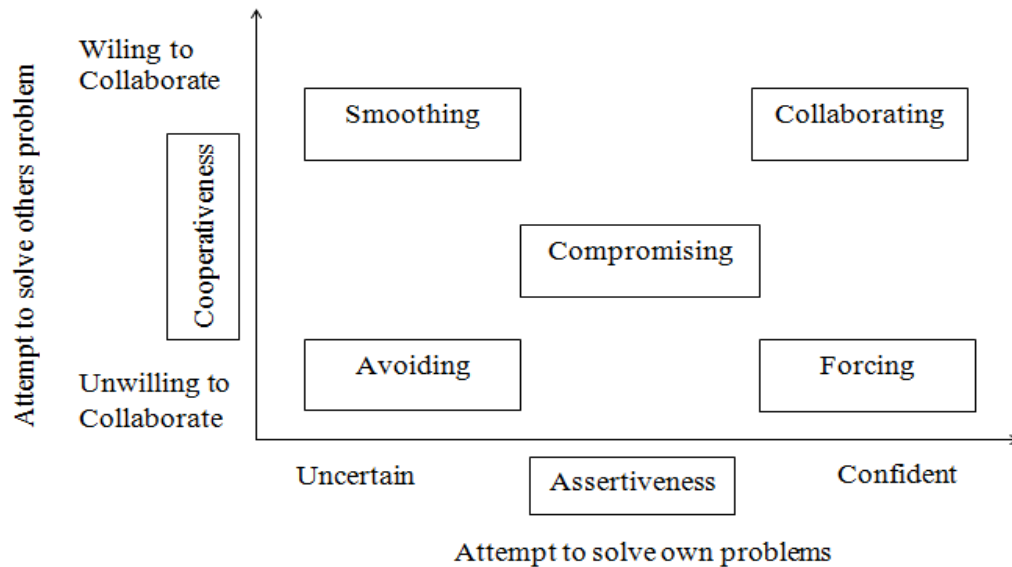


Figure 2.5(b): Thomas-Kilmann Conflict resolution strategies

(Source: Stanslaus, 2011).

From the above figure, it is understood that each of the five modes of resolution approaches are characterized by two components, which are assertiveness and cooperativeness. It is a conflict style model developed to assess the response to conflict situations based on the individual perceptions. The model shows that avoiding strategy has the low assertiveness and low cooperativeness when a person withdraws from the conflict situation. On contrary, forcing approach has low cooperativeness and high assertiveness when one can place his own concerns and issues and ignoring the concerns of others. This forcing style will dominate and control the situations and wanted to win everything and forget the other's concern. It is 'do and die' situation where stakes are high and thinking the relationship is not important. The conflict level is extremely high and results in win-lose situation. Compromising approach has the equal weight to both assertiveness and cooperativeness. Compromising is like give and take style. Both parties negotiate to arrive at mutually acceptable decision and get

equal satisfaction. Such situation occurs when parties don't want to break relationship and suffer lost in a limited time. Whereas on the other side, smoothing has high cooperativeness and low assertiveness when one party becomes full cooperative and share to the other parties at his own cost and concerns. The approach having the high cooperativeness and assertiveness is the collaboration between parties meeting their needs equally in conflict situations. It is a win-win situation in collaborating approach. However, the conflict management style depends on the behavior and personalities of a person that who attempt to resolve the conflicts based on the nature and intensity of conflicts (Brandt and Murphy, 2000).

Conflict resolution study in Tanzania and Saudi Arabia

In a study of conflicts in Tanzanian construction industry, the researcher had approached five resolution strategies such as collaboration, compromising, smoothing, avoiding and forcing modes for resolving different areas of conflicts in building construction projects. For instance, conflict area in design errors, the most preferred resolution approach was the collaboration followed by compromising, smoothing, forcing and withdrawing approaches. This approach to conflicts with design errors indicates that the parties working in the construction have high assertiveness and high cooperativeness as well. Noticed from their studies that almost all of the areas of conflicts have high collaboration and compromising situation between the parties. The very less are attentive in forcing and withdrawal situations. The reasons might be the perceptions from the construction were shallow and the areas of conflicts were non subjective issues. Whereas in Arabian study, compromise has found to be most preferred form of resolution closely followed by problem solving and smoothing approaches in the second and third place. The least levels of frequency and effectiveness was found in forcing and withdrawal modes. Their results are shown below in comparative format in table 2.5 (c).

Table 2.5(c): Comparison of ranking of resolution approaches applied**(Source: Sedairy, 1994; Stanslaus, 2011)**

Conflict Resolution	Tanzania	Saudi Arabia
Compromising	2	1
Problem Solving/Collaboration	1	2
Smoothing	3	3
Forcing	5	4
Withdrawal	4	5

Although, the previous researches has explored various resolutions to manage conflicts but they have directly attempted in management of conflicts without determining the specific issues of conflict. Just only the causes of conflicts would not have been the basis for getting the practical judgment by the respondents since the main issues of conflicts and conflict levels have overlooked in both studies. So, the conflict resolution techniques may depend on the identification of conflict issues and the level of conflicts experiencing during execution (Blake and Mouton, 1964). One has to evaluate and analyze the situations in the first place and choose the appropriate strategies for managing conflict in order to reduce escalation of conflict and to create conducive environment for achieving good relationships and project success on areas of time, cost, quality and safety. But these specific issues to recognize the level of conflicts have not been attempted in previous research. Therefore, in order to reduce the conflicts by application of resolution strategies might be realistic and more practicable if the specific issues had been evaluated.

2.5.3 Conflict Prevention Strategies

Furthermore, this section describes about the conflict avoidance model that has been studied in Korean Construction industry. The model basically has been developed based on the six critical perceived factors to reduce any conflicts in the construction site. It consists of four main processes as shown in figure 2.5(c) which are: (1) Identification of factors of conflicts, (2) Response to conflict factors, (3) Implementation of avoidance measures and (4) Continuous monitoring of avoidance measures.

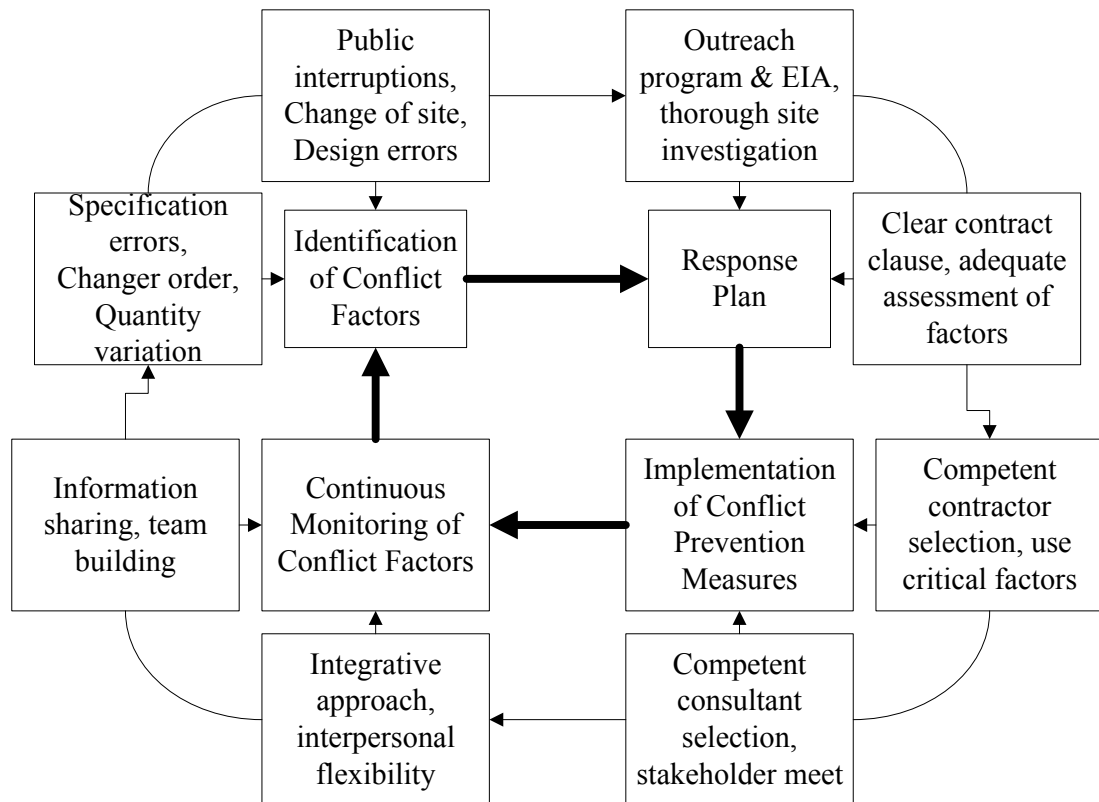


Figure 2.5 (c): Conflict Avoidance model (Source: Archarya, 2006)

Each component of model is briefly explained below:

1. *Identification of conflict factors*

The factors of conflicts can be determined from the participant's perceptions on experiencing conflict situations in the project. Based on their perceptions, the factors can be listed for study for particular project case. For example the identified factors are such as design errors, change of site conditions, quantity variations, mistakes in specification and public interruptions etc.

2. *Response to conflict factors*

In this the response plan can be formulated to assess the actual causes to avoid the conflict factors that identified earlier. After knowing the root causes of the conflict, then appropriate solutions such as review of contract clauses, thorough site exploration, and meeting with public and then adequately assess the causes and situation can be done in this stage.

3. *Implementation of avoidance measures*

This process includes implementation of various proactive measures to avoid conflicts after it has been assessed in the earlier stage. It includes proper documentation of site records, reliable contractor selection, and appointment of good consultant, project lead by owner representative, stakeholder participations and use of integrating style of management (compromising and collaboration) to avoid the conflicts.

4. *Continuous monitoring of conflict*

This process includes good information sharing, team building approach, understanding behavior and personalities of parties, focus on maintaining good relationships and flexibility etc. If the conflicts are still exists, then revised the plan and prepare for next step as such the cycle completes and repeats.

The conflict avoidance model might have well established for preventing conflicts in construction. But how the model serves the purpose in attempt to prevent conflicts without actually understanding the reasons and basis for conflicts? Even though, the model consists of several prevention steps such as response plan, prevention measures and continuous monitoring. This merely described that could really make sense in trying to reduce conflicts. However, to overcome this research gap, the current research was undertaken to evaluate the underlying conflict issues and then to identify its root causes, so that appropriate solutions can propose to reduce the conflicts in better approaches.

2.6 Research Gap

From the previous researches on conflict management in construction still have limitations such as evaluation of specific conflict issues. This indicates that specific conflict issues needs to be studied to reduce conflicts in construction. It will be better and realistic for project participants to be aware and understand the basics of the underlying conflict issues in particular if the conflict issues are evaluated. Because project participants should have a clear idea of a conflict when faced with any issues

(Thomas, 1994). The causes and its sources can also be traced in meaningful and justifiable way if the conflict issues that occur during constructions are acknowledged specifically. So that appropriate solutions can be apply to reduce conflicts by analyzing the actual causes and its sources. Even the application of various resolution and prevention strategies can be applied in realistic manner if we have clear understanding of conflict and its underlying specific issues.

However, to reduce conflicts, many approaches have been applied into construction. To summarize the previous researches, Acharya (2006) identified several factors and categories of conflicts. They measured the perceptions of conflicts from the field experienced professionals. They developed conflict avoidance model to avoid conflicts in construction. Furthermore, Stanslaus (2011) had tried to measure perceptions of owners, contractors and consultants in building projects and applied resolution strategies. In another research in 1994 (Sedairy, 1994) had undertaken to resolve conflicts by application of resolution strategies in Saudi Arabian construction projects.

Although, all researches might have well established but the conflict still occurs in construction projects. It revealed that all of previous researches did not focus on specific conflict issues. Instead they have focused on identification of causes and factors of conflicts. Researches (Stanslaus, 2011; Sedairy, 1994) were focused on conflict resolution approaches without evaluating the actual conflict issues. Even, previous research lack clear categories of causes, factors and areas of conflicts. This means that causes and factors might be just the problem and not conflict. Moreover, previous research did not evaluate specific conflict issues related to time, cost, quality and safety. Because the underlying issues that usually have conflicts in construction projects are mainly due to project time, cost, quality and safety (Fenn and Gameson, 1991; Kumaraswamy, 1998).

Table 2.6(a): Research gaps (Source: Sedairy, 1994; Acharya, 2006; Stanslaus, 2011)

Previous Researchers	Findings	Limitations
Sedairy (1994)	List of causes and conflict resolution strategies	Specific Conflict Issues
Acharya (2006)	List of causes and conflict avoidance model	Specific Conflict Issues
Stanslaus (2011)	List of causes and conflict resolution strategies	Specific Conflict Issues

It can be summarized from the research gaps that there are limitations on previous research on conflict management. First, previous research did not evaluate the conflict issues. Second, previous studies did not focused on specific conflict issues related to time, cost, quality and safety in construction. Instead they have directly tried to solve conflicts without understanding the actual conflict. The issue might have specific reasons that led to conflict. Because just the identified factor may not cause conflicts unless its specific issues are understand clearly and evaluated. Therefore, this research is attempted to propose new approach to evaluate the conflict issues between public owner and contractor during construction phase. It analyzes the root causes of conflict issues. Optimistically, this research will contribute to the public owners and contractors to comprehend the issues and level of conflicts in public projects. In addition this can give clear understanding of different conflict situations before undertaking any public projects. Furthermore, this research attempts to propose alternate solution to reduce conflicts. Therefore, it should be an alternative approach to evaluate the conflict issues that may occur and work with proactive approach for reducing such conflicts.

2.7 Summary

This chapter presented the main idea on why this research was conducted. First, it started with brief description of construction situations in Bhutan. It explained about the importance, challenges and issues facing in the developing industry. Likewise, it continued with explanation of the phenomena of conflicts in construction. It included the concepts of conflicts, types, development and its influence in

construction. More specifically, it explained the conflicts and its ideology behind from risks, problems; claims and disputes related its meaning in construction. It also explained about the reasons of conflicts, its causes and the conflict issues in construction project. At the end, it described about the previous researches related to conflict management in construction. It got clarified with why this research has to be conducted from the research gap. It closed the chapter with the research gap such as lack of specific study on conflict issues related to project objectives (time, cost, quality, safety etc.) and on evaluation of conflict issues in construction. Therefore, this research was proposed and conducted to fill this research gap.

CHAPTER III

RESEARCH METHODOLOGY

This chapter describes the research methodology for identifying the level of perceptions on important conflict issues and evaluating the level of conflict in public projects. It also describes about designing the data collection system and analyzing the result. It begins with the description of research approach which consists of both quantitative and qualitative approach and followed by explanation of this research design and structure. The data collection method part explains about the preparation of questionnaire, target sampling and interview method. Lastly, it explains about how to analyze the data.

3.1 Research Approach

To achieve the research objective, the research was adopted both quantitative and qualitative approaches. Based on the specific data requirement for the research, it has different meaning for these approaches. First, quantitative research approach is the way that data can be gathered in numerical style and items are measurable for analysis. This requires the research data to be collected from samples that fulfill our requirements through questionnaire survey. So, quantitative research approach is assessable, statistical and quantifiable that can test hypothesis (Bryman, 2006). Moreover, it enabled data to be collected from potential respondents through questionnaires which are measurable in scale information. Second, qualitative research approach is mainly applied to gather the data based on the perceptions or experience judgment of the respondents. This was conducted through interview technique. This approach depends on the people who interview's behavior and the personality, knowledge and its attitude that depends on the situation in trying to exchange and share information about the research. However, it has advantages like gathering collective information and purposeful data required for the research if conducted thoroughly and in convincing manner.

The research attempted to identify the level of perceptions on conflict issues from public owners and contractors. It also proposed new approach for evaluating the level of conflicts in public projects from public owner and analyzes the root causes and solutions of critical issues. The results for this approach are displayed in statistical form, tables and graphical representation. So, this research was application and descriptive in nature. Hence, both quantitative and qualitative approaches are used.

3.2 Research Design

This section describes about research design framework. It consists of several steps as follows:

1. With the research idea, the literature review was conducted to frame research importance, problem statement based from previous studies and limitations and accordingly frame the research objectives. It's also to develop the items of conflict issues.
2. The research design was to select appropriate methodology and set procedures and look for practicality of the research. The questionnaire sample was prepared based on the field experiences, expert opinions and from the literature to identify conflict issues that occur during construction phase.
3. Conducted data collection with the questionnaire survey and interview. It also includes pilot study before actual running of formal survey. The preparation to conduct survey, coding and entering data before analysis.
4. Analyze the data with mean ranking, independent-samples T-Test analysis, evaluating level and grouping. The qualitative analyses are to categorize, transcribe and interpret the interview results.
5. The research conclusion is to tie up with the research objectives with the findings, limitations, contribution and direction for future research and benefits.

The detail about the research design and framework is given in figure 3.1.

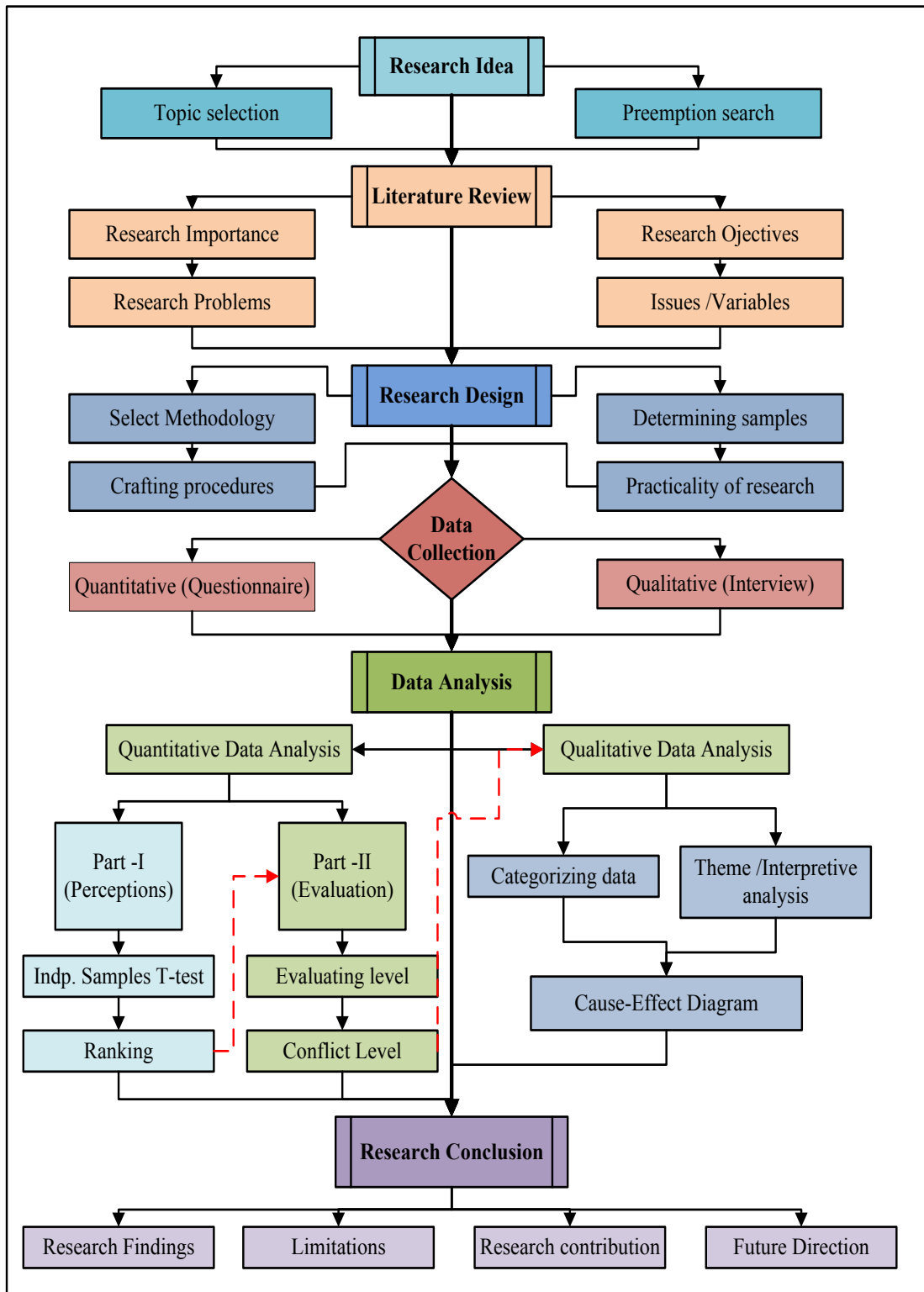


Figure 3.1: Research design and framework

3.3 Data Collection Method

The data collection method was divided into two phases. The first phase was about the questionnaire method (quantitative) and the second phase was the interview method (qualitative). Both of this method found to be suitable for this research since it has less time and funding. Nevertheless, both of this method has facilitated to get required amount of data collected from the respondents. Having facilitated with required data, it achieved the convincing results for this research (Doloi and Lim, 2007; Gillham, 2000). In addition, the questionnaire and interview approach has more convenient for research which required realistic perceptions, good judgment and practical opinions based upon field experiences and information (Vaus, 2002). However, before carrying out the actual survey, the population sampling and questionnaire pattern was considered.

3.3.1 Target Population and Sampling Method

The non-probability sampling technique was chosen for this research survey to target from the population. This technique was reliable and convenient because it took less time and cost comparing to probabilistic technique (Vaus, 2002). Moreover, data was collected in reasonable and descriptive way in a systematic manner. The samplings of the public construction projects were targeted on public owners and contractors. A list of details about the samples or the respondents was collected from the office of construction association of Bhutan (CAB). Moreover, the permission from the Director of Department of Engineering Service (DES) under Ministry of Works and Human Settlement (MoWHS) was sought out for carry out the survey. Then the permissions from the individual respondents regarding survey were sought out and accordingly conducted the actual survey in line with the appointment.

3.3.2 Questionnaire Design

The close-end questionnaire was developed based upon the field experiences and grouped from the previous researches that are related to conflicts in construction

(Acharya, LeehasIm, 2006; Stanslaus, 2011). The questionnaires consist of two parts. The first part consists of respondents profile and questions on identification of level of perceptions on conflict issues in public projects from public owners and contractors. Second part consists of respondents profile and questions for evaluating level of conflicts in public projects from public owners. It also include interview for respondents to discover the root causes and solutions to reduce conflicts during construction phase.

Next, the measurement of level of respondents' perceptions on conflict issues and evaluation of level of conflicts was the concern in order to have realistic output from the data. However, there are various data measurement methods out of which the likert scale was chosen for this research. The reasons for choosing the likert scale for this research is compared in table 3.1.

Table 3.1: Comparison of different data measurement scales
(Source: Hardegree, 1980; Clason and Dormody, 1994)

Measurement Scale	Characteristics
Nominal scale	Data can have different numbers under many categories (eg. Men, women, thin, fat etc.)
Ordinal scale	Data will range from lowest to highest (eg. End point of car racing road or 0, 1,2,3.....100)
Interval scale	Data can have constant value which is quantitative (eg. Same distance between 1.82m & 1.70m and 1.70 m & 1.58m)
Ratio scale	Data can have zero point, otherwise is similar to interval scale (e.g. 0.5)
Likert scale	Data can be arrange in agreement to disagreement style with the numerical values (eg. 1 to 5 or 7)

Therefore, likert scale measurement type was selected for this research as this research attempted to collect information from the public owners and contractors regarding their experiences and level of conflicts and percentage of its occurrence. This measurement gives more reliability and accurate information for computing the results comparing to other scales (Clason and Dormody, 1994).

Accordingly, the questionnaire was prepared in a five-point Likert type scale to rate the respondent's response for each conflict issues. For the first part, respondents can rate the number that represents their response with agreement or disagreement for each conflict issue according to the following scale as shown in table 3.2. Similarly for the second part, respondents can indicate their level of conflict whether high or low and percentage of its occurrence assigned by the respondents based on the following scale as shown in the table 3.3. This scale was adopted based on the field experiences, academic intuition and limitations from previous researches projects (Handy, 1983; Gardiner and Simmons, 1992; Brown and Marriot, 1993; Hellard, 1998).

Table 3.2: Likert scale type used for measuring perceptions

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Scale	1	2	3	4	5

Table 3.3: Likert scale type used for measuring level of conflicts

Conflict level		Meaning of conflict level	Scale
Level 1	Very Low	Incompatibility	1
Level 2	Low	Disagreement	2
Level 3	Moderate	Antagonism	3
Level 4	High	Frustration	4
Level 5	Very high	Dispute	5

Before running of the actual survey, the questionnaire was done with piloting where the ten experts were asked to check the relevancy, lengthy, structure and wording of the questions, and any ambiguities that have not noticed. Moreover, it was checked for any addition of conflict issues that are prevalent in the public projects. This was done to have self-confident of the applicability of conflict issues considered and clarity in questionnaires to convince the respondents during the actual survey. Having done these it was also expected to ensure the consistency, reliability and validity of the data later. Hence, the modification was made to the questionnaire and organized for formal survey running. The additional conflict issues and information from experts and literature review are given in table 3.4 and table 3.5 below.

Table 3.4: Summary of Conflict Issues from Literature Review

Sl.no	Conflict Issues from Literature Review					
I	Conflict Issues related to Project Time	(Acharya, 2006) Korea	(Stanslaus, 2011) Tanzania	(Tajul, 2010) Malaysia	(Sedairy, 1994) Saudi Arabia	(Leung, 2001) Hongkong
1	Slow decision making by client is conflict issue related to project time	✓	✓			
2	Poorly develop project planning and scheduling is conflict issue related to project time.	✓	✓			
3	Late handover and change the location of construction sites/areas is conflict issue related to project time.	✓	✓			✓
4	Time extension request (inadequately or not reflect to contract) for delays caused by adverse weather conditions and acts of god is conflict issue related to project time.		✓	✓		
5	Delay of construction project due to material shortage is conflict issue related to project time.				✓	
6	Time extension due to design changes is conflict issue related to project time.	✓	✓			✓
7	Slow progress/performance by contractor is conflict issue related to project time.		✓			
8	Delay of project schedule due to equipment shortages is conflict issue related to project time.		✓			
II	Conflict Issues related to Project Cost					
9	Late payment by client is conflict issue related to project cost.	✓	✓		✓	

Table 3.4: Summary of Conflict Issues from Literature Review (Contd.)

III	Conflict Issues related to Project Quality					
10	Unclear/Incomplete technical specifications are conflict issue related to project quality.	✓	✓			✓
11	Non-compliance with quality control/quality assurance system or processes is conflict issue related to project quality.		✓		✓	
12	Ambiguous instructions and unqualified/unskilled operators or workers are conflict issue related to project quality.		✓		✓	
13	A different perception on work quality acceptance is conflict issue related to project quality.					✓
14	Lack of detail drawing is conflict issue related to project quality	✓	✓			✓
IV	Conflict Issues related to Project Safety					
15	Non-compliance with occupational health & safety regulations is conflict issue related to project safety.		✓			✓
V	Conflict Issues related to Project Scope					
16	Frequent change orders causes uncontrolled project schedule is conflict issue related to project scope.	✓				✓
VI	Conflict Issues related to Personal and others					
17	Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to project personnel.		✓		✓	
18	Pollution during constructions and affect to environment is conflict issue related to environment.	✓	✓			

Table 3.5: Summary of Conflict Issues from Experts

Sl.no	Conflict Issues from Experts											
	I	Conflict Issues related to Project Time	PO1	PO2	PO3	PO4	PO5	C1	C2	C3	C4	C5
1		Financial problems/bankruptcy of contractors caused delay in construction project is conflict issue related to project time.	✓				✓					
2		Late approval or permit from regulators (road permit, environmental clearance, building, municipal permit or approval etc.) is conflict issue related to project time.	✓	✓			✓	✓				✓
3		Time compensation for delay caused by external influence such as bureaucratic/ political/public interruptions is conflict issue related to project time.		✓	✓				✓			✓
4		Long waiting time for drawing approval is conflict issue related to project time.		✓		✓		✓		✓		
II		Conflict Issues related to Project Cost										
5		Quantity errors in BOQ affect calculating work quantity for payment is conflict issue related to cost.	✓		✓						✓	✓
6		Cost of rework from non-sequencing work due to government or unexpected social events request is conflict issue related to project cost.	✓	✓								✓
7		Lack of clear information to address the price escalation index is conflict issue related to project cost.	✓		✓			✓				
8		Payment for overtime working due to urgency of government or unexpected social events is conflict issue related to project cost.	✓			✓			✓			
9		Unrealistic cost negotiation for new items are conflict issue related to project cost.			✓						✓	✓
III		Conflict Issues related to Project Quality										
10		Use of outdated drawings and specifications are conflict issue related to project quality.			✓			✓	✓		✓	✓
11		Inadequate quality testing facility is conflict issue related to project quality.	✓			✓		✓				✓
12		Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to project quality.	✓		✓				✓			
13		Inadequate supervision, regular inspection or verification on construction site by client engineer is conflict issue related to project quality.		✓				✓		✓	✓	✓
14		Use of low quality & cheap materials are conflict issue related to project quality.	✓	✓			✓					✓
15		Owner acceleration of work progress by rushing activities causes poor quality of work is conflict issue related to project quality.					✓			✓		✓

Table 3.5: Summary of Conflict Issues from Experts (Contd)

IV	Conflict Issues related to Project Safety												
16	No first aid & lifesaving appliance at construction site is conflict issue related to project safety.		✓		✓								
17	Employment of illegal labor (child labor) is conflict issue related to project safety.		✓										
V	Conflict Issues related to Project Scope												
18	An unforeseen underground condition is conflict issue related to project scope.	✓				✓			✓				
19	Excessive variations of quantity such as requiring massive earth excavation are conflict issue related to project scope.					✓			✓				
20	Frequent change orders cause extra cost of work preparation or rework is conflict issue related to project scope.		✓					✓					✓
21	Unclear debris and construction waste are conflict issue related to project scope.	✓										✓	
VI	Conflict Issues related to Personal and others												
22	Irresponsibility/ Lack of commitment/attitude & personality problem are conflict issue related to project personnel.		✓					✓				✓	
23	An error in contract document & violating terms & conditions of contract is important conflict issue related to project contract.			✓									✓

3.3.3 Questionnaire Method of Data collection

This section describes about the data collection process. The focus of the study was not on industry level, but rather on the public construction project level. Therefore, the distribution of questionnaire was not so extensive in general, non-discriminate in a sense, rather was highly particular. The sample size was determined based on practical concerns as tempered by the local project natures and peculiarities of the respondents groups.

The first part of data was collected in the month of January and early-February, 2013 in Bhutan. The questionnaires were distributed personally to 100 respondents and explained the concepts and main purposes of the research. The main purpose of this phase was to identify level of perceptions on conflict issues in public projects. Each respondent was interviewed in person or in group regarding their

perceptions on conflict issues while undertaking the public projects. This action was to reduce the misinterpretations while answering the questions and also to increase the rate of responding to the questionnaire. Moreover 5 questionnaires were sent via email to the particular respondents those who cannot meet personally because of the remote location of projects, long distance and cold winter. All of these 5 respondents was phoned and convinced ahead regarding the research objectives and procedure on how to fill questionnaires. In total 78 questionnaires was able to gather from 100 respondents which made 78% response rate in overall.

The second part of data collection was conducted once the analysis results of perceptions on important conflict issues from the first part was completed. Hence it was carried out in the month of February-end and March, 2013 in Bhutan. This part was the important and most difficult one as it was not easy for every respondent to evaluate the conflicts unless they were qualified, experienced and competent. The evaluators required critical thinking and needed to assess according to practical experiences from their past projects and that are ongoing. However, the questionnaire was distributed to 60 respondents and able to collect 49 papers which had 82% response rate. During this phase, the respondents were explained to evaluate the level of conflicts experienced during construction phase in public projects on the scale from conflict level 1 (Very low) to level 5 (Very high). The five conflict level used for evaluation was level 1 (Very low) =Incompatibility, level 2 (Low) =Disagreement, level 3 (Moderate) =Antagonism, level 4 (High) =Frustration and level 5 (Very high) =Dispute as described in table 3.3(c). Respondents were also explained on how to rate the percentage of conflict occurrence at respective conflict level that measure the conflicts concentration based on their actual experiences during course of construction time. It took more time during this second part data collection.

3.3.4 Qualitative Data Collection

This section describes about the qualitative data collection method with interviewing technique. The interview session was conducted along with the second part data collection (February-end and March, 2013) due to time constraints. The

main purpose of conducting interview was based on three points. The first point was “what are the root causes of critical conflict issues”. This inquiry was basically to discover the main reasons and root causes of the conflict issues during construction. The second verbal inquiry was “what are the current practices when conflicts occurred during construction”. Third point was “what strategies or solutions would be appropriate to reduce such conflicts”. This was to better understand and gain explicit knowledge in the research findings.

The interview technique was also aimed at assuring the validity of the conflict issues experienced by public owner with contractors during construction phase. Moreover, it was able to discover the underlying causes of conflict issues from their comments, suggestion and feedbacks. More interestingly it revealed how each respondents think, experience, feel about conflicts and its effects on their performance while undertaking public construction projects. This approach also made to clarify them on the differences in opinion regarding construction problems, risks and conflicts in construction projects. These tasks was more challenging and convincing one since it was the opportunity to expose the actual situations and practices they face in construction from Bhutanese context. However, there are advantages for taking interview process for data collection. The advantages were effective ways to collect detail information about their perceptions, opinions and practical ideas, allowed free to ask questions and got good response, feedbacks, criticism and comments.

There were also some disadvantages during interview as different respondents interpreted in different meanings based from their personality and judgment, non-responsive, time consuming and negative thoughts etc. However, such drawbacks were organized by treating them well, talking importance of research objectives and outcome/benefits, bad consequences of conflicts in construction, motivated and make them to realize the real effects of conflicts etc.

3.4 Data Analysis

This section describes about the data analysis part for the research. There are three main reasons for performing the data analysis. First, the data analysis was to obtain the level of agreement on conflict issues in public projects between public owners and contractors from their perceptions. The ranking of conflict issues from perceptions was discovered from mean value criterion and independent-sample t-test analysis. Second, purpose of conducting data analysis was to get the level of conflicts in public projects from public owner's evaluation of conflict issues. Software of Statistical Package for Social Science (SPSS) was used for analyzing the data. The explanations about the method used for analysis are presented in the next section. The third stage of analysis was the interview results.

3.4.1 Mean and Standard Deviation

The purpose of mean index used in the research is to measure the central tendency because they centralized the research data or middle value. It can also improve the measuring techniques by knowing the relative trends and set logical sequences by reducing the experimental errors as the data are recorded exactly in the same manner every time. Whereas the standard deviation can measure the point of dispersion of data from the mean value because the data sets can disperse widely or narrowly from mean which likely depends on the normal distribution. As such the mean index and the standard deviation has significantly used in the previous researches for exploring important variables and ranking the critical factors.

Acharya, Leehas and Im, (2006) has used mean value to determine the ranking of conflicting factors in construction projects from participant's perspectives in Korea. Stanslaus (2011) had also ranked the causes of conflicts in building projects by using mean and standard deviation. Mosta (2006) had used mean and standard deviation to explore the important factors causing dispute for managing construction disputes in Malaysia. Similarly, Fikiemo (2008) had also used mean index to determine factors affecting cost of construction in Nigeria. Egbelakin (2007) explored

the foreign firm's strategies and project management practices in China using mean and standard deviation index. Therefore this research also used the mean index to identify the level of perceptions on conflict issues and evaluating level of conflicts in public projects. The research questions were basically based on perceptions, judgment and actual assessment of conflict levels from experiences in public projects. Thus, the mean value was calculated from the given formula for ranking conflict issues and level of conflicts. The mean index is defined as the average value calculated from sum of all rated values from respondents and divided by total number of respondents or sample size. The sample mean in mathematical can be computed from the formula below.

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x \quad (3.1)$$

Where, n = represent the sample size or number of respondents

$i=1, 2, 3 \dots$ and

$\sum x$ = the sum of observed value from respondent's total score.

The standard deviation is calculated from the following steps:

1. First computes the sample mean
2. Subtract the mean value from sum of observed values of total respondents score
3. Square all the differences in step 2
4. Add all the values and divide by $n-1$ where 'n' is the number of respondents or sample size. This gets the variance
5. Take square root of the variance to get the standard deviation.

$$s = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x - \bar{x})^2} \quad (3.2)$$

The standard deviation measures the dispersion of the data set and the relationship of data with the mean. From the normal distribution if the data scores are fairly close to the mean, then it revealed response scores are fairly uniform indicating

the standard deviation are very less dispersed. On the other hand, if the data scores are wide from mean, it tells us that the response score has wide variances from mean. As a result the standard deviations are large or widely dispersed. The standard deviation can be zero if the data scores are equal.

3.4.2 Independent-Sample T-test

There are two method of conducting t-tests, independent-samples t-test and paired sample t-test. The first one is used basically to compare the mean scores perceived by two different groups of respondents and the second method is used for comparing the mean score from same group but on different occasions having a matched pairs. But for this research, independent-samples t-test was selected depending on the type of data and the respondent groups that have been used for identifying level of perceptions on conflict issues and level of conflicts in public projects. It basically determines whether there is statistical significant difference in the mean scores or not from the group.

However to analyze the data, there were dependent variables (DV) and independent variables (IV). The dependent variables (DV) were from two groups, the public owner's perceptions (group 1) and contractor's perceptions (group 2) on identifying the level of perceptions on conflict issues. The independent variables (IV) were the 41 numbers of important conflict issues in public projects. The hypothesis was formed are:

$H_o : M1=M2$ which means there is no significant difference in the level of perceptions on conflict issues from public owners and contractors.

$H_o : M1\neq M2$ which means there is statistical significant difference in the level of perceptions on conflict issues public owners and contractors.

Before performing the analysis in SPSS (Software of Statistical Package for Social Science) there are number of assumptions that should be check such as level of measurement, random sampling and independence if observations etc. However, after the analysis, in order to interpret the analysis results; we should check the homogeneity of variance assumption which is check by Levene's test. This Levene's test, tests whether the variances of the two scores of the groups are same or not. The output from independent-samples t-test can be interpreted by checking the significance level for Levene's test which is 0.05 as cut-off value having verified whether assumption of equal variances has been violated or not. If significant value is larger than 0.05, then first line in the table can be considered which indicates equal variances are assumed. On the other hand, if the significant value is less than 0.05, this means the variances for the two groups are not same indicating violation of the equal variance. Yet, SPSS provides alternative t-value where we can refer to equal variances not assumed. Finally, in order to find out whether there is a significant difference between the groups (public owners and contractors); it was referred to sig. (2-tailed). From labeled Sig. (2-tailed), the values having less than 0.05 was considered to have significant differences in the mean score and values above 0.05 were considered as there are no significant differences between them. However, the probability value (p-value) of a statistical hypothesis test is equally distributed on both extreme sides in 2-tailed test. It should be considered that the null hypothesis is rejected at 5% significance level, this would report as "p<0.05". The mean difference between the two groups is also given with the 95% Confidence Interval of the difference. This presume null hypothesis of the research.

3.4.3 Analysis of Conflict Level and Interview Results

The analysis of conflict level was based on the percentage of conflict occurrence at respective level. At respective level, it measures the conflict concentration from respondent's actual experiences during course of construction time. Therefore the conflict level for each issue was calculated from distribution of conflicts that occurred at respective levels. The method for calculating conflict level was based on the weightage (W) at each level as: $CL = (W1)1.00 + (W2)2.00 + (W3)3.00 + (W4)4.00 +$

(W5)5.00. The conflict levels are range on the scale from 1(Very low) to level 5(Very high). The five scales used for evaluation was level 1 (Very low) = Incompatibility, level 2 (Low) = Disagreement, level 3 (Moderate) = Antagonism, level 4 (High) = Frustration and level 5 (Very high) = Dispute. Finally, the box and whisker plots were used for this study to see the confirmation of evaluation results on the distribution of conflict occurrences at different conflict levels. The box and whisker plots are helpful in graphical display for summarizing the distribution of data sets (Becktti and Cohen, 2006). It can compare the distributions of data range at glance and help us to know the center, variations, skew and overall range.

The interview results were interpreted into groups in tabular format and 10 critical conflict issues were selected from the high conflict levels. Further, there were classified and themed from the reports maintained during interview and grouped from the respondent's assessment on conflict issues. The interview results was used along with critical conflict issues for developing cause and effect diagram (Ishikawa, 1960).

3.5 Summary

This chapter presented the methodology for conducting this research. The research methodology was based on both quantitative and qualitative approach. It explained about the quantitative research which was carried out through questionnaire method. And this method consists of two stages for questionnaire survey such as pilot study and data collection. The pilot study was mainly aimed at achieving reliability and validity of the questionnaire before actual running of the survey. Thus, the improvement and modification was made to the questionnaire accordingly and then run the formal survey of data collection. Further, it has explained about the population and sampling for the survey. Next, it explained about the qualitative research approach that was conducted through interview technique. It concluded with brief explanation on data analysis and interpretation part; however detail analysis parts are presented in the subsequent chapters.

CHAPTER IV

IDENTIFYING PUBLIC OWNERS AND CONTRACTOR'S PERCEPTION ON IMPORTANT CONFLICT ISSUES

This chapter focuses on the public owners and contractor's perceptions on important conflict issues. First, it begins with the description of survey data that were collected through questionnaire survey including their response rate, respondent's working experiences and qualification. Second, it describes the analysis of quantitative data in separate groups from perceptions of public owners and contractors. Then it explains about ranking of each item for determining the level of agreement on important conflict issues. Next, the analysis reveals important conflict issues from each group related to project time, cost, quality, safety, scope, personnel and others perceived by public owners and contractors. This chapter also focuses on description of the analysis to determine whether the selected important conflict issues have significant differences in their perceptions. Basically this chapter describes about the level of perceptions on important conflict issues from both groups and selecting important conflict issues.

4.1 General Survey Details and Respondent Profile

The first phase of data was collected in the month of January and mid-February, 2013 in Bhutan. The questionnaires were distributed personally to each person and explained the concepts and main purposes of the research. Each respondent was interviewed in person or in group regarding their perceptions about the agreement on important conflict issues while undertaking the public projects. This action was to reduce the misinterpretations while answering the questions and also to increase the rate of responding to the questionnaire.

4.1.1 Response Rate

There were 100 questionnaires distributed in the first part and the respondents were mainly public owners and the contractors as they are the major role players in

undertaking any public construction projects. It was focused on these two groups since conflicts are mostly being faced between them. During this initial phase, number of responses received were relatively high for public owners (45 samples) comparing to contractor's response (33 samples). The total of 78 samples received made the response rate up to 78%.

Table 4.1 Details of Questionnaires distribution and their responses (Part I)

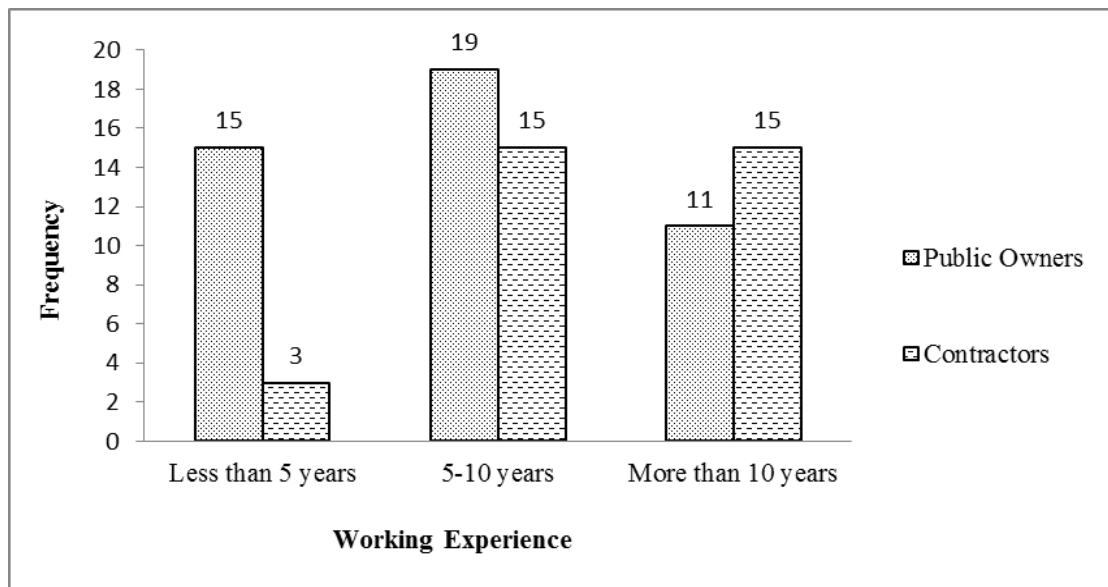
Weeks	Distributed			Received			Response Rate
	Total	P. Owner	Con	Total	P. Owner	Con	Overall
week 1	25	15	10	20	12	8	72%
week 2	16	8	8	13	7	6	81%
week 3	15	8	7	12	6	6	80%
week 4	20	10	10	16	9	7	75%
week 5	18	10	8	11	5	6	78%
week 6	6	6	0	6	6	0	100%
Total	100	57	43	78	45	33	78%

4.1.2 Respondent's working experience

Personal experience in the construction field may enable them to identify and perceive the important conflict issues more realistically. In this research, personal experience varies from 1 year to more than 10 years which were classified into three categories as shown in table 4.2. The respondent's experience in construction field varies such as 15% of respondents belonging to public owners and 9% of contractors having less than 5 years of working experience; 42% of public owners and 45% of contractors having 5-10 years of working experiences; and 24% public owners and 45% contractors having working experience of more than 10 years. Hence, all the respondents had experiences in construction field. However, the overall percentage of respondent's experience during the initial survey was 23% having less than 5 years of experience, 44% in 5-10 years' experience and 33% had experience of more than 10 years.

Table 4.2 Respondent's experience in public projects (Part-I)

Experience	Public Owners		Contractors		Overall Frequency	Overall Percentage
	Freq	%	Freq	%		
< 5 years	15	33%	3	9%	18	23%
5-10 years	19	42%	15	45%	34	44%
> 10 years	11	24%	15	45%	26	33%
Total	45	100%	33	100%	78	100%

**Figure 4.1 Respondent's working experience in public projects (Part-I)**

4.1.3 Position and Qualification of Respondents

In addition, it describes about the position and qualification of respondents participated in the first part survey. The qualification of respondents was revealed in three categories. The maximum numbers of respondents were 47, who had maximum qualification of diploma in engineering, 26 of them had bachelor degree in engineering and 5 of them had master degree in engineering. This research was found that total of 78 samplings comprised of 60% having qualification of diploma in engineering, 33% of bachelor degree and 7% of master degree in civil engineering respectively. However, the respondent's position in the project was also considered as key criteria for identifying the important conflict issues. In this research, the target respondents were on field experiences in public projects, the participated respondents

had held various positions and the maximum number of positions were project engineers as shown in table 4.4 and figure 4.3. In conclusion, the minimum number of respondent had high position such as the chief engineer (1%), followed by 4% project manager. The respondent having the lowest position of 9% assistant engineers and 10% junior engineers were also participated for this first part of research in identifying conflict. The maximum frequency of respondents was the project engineers with 62%.

Table 4.3 Respondent's qualification in public projects (Part-I)

Qualification	Frequency	Percentage
Diploma	47	60%
Bachelor Degree	26	33%
Master Degree	5	6%
Total	78	100%

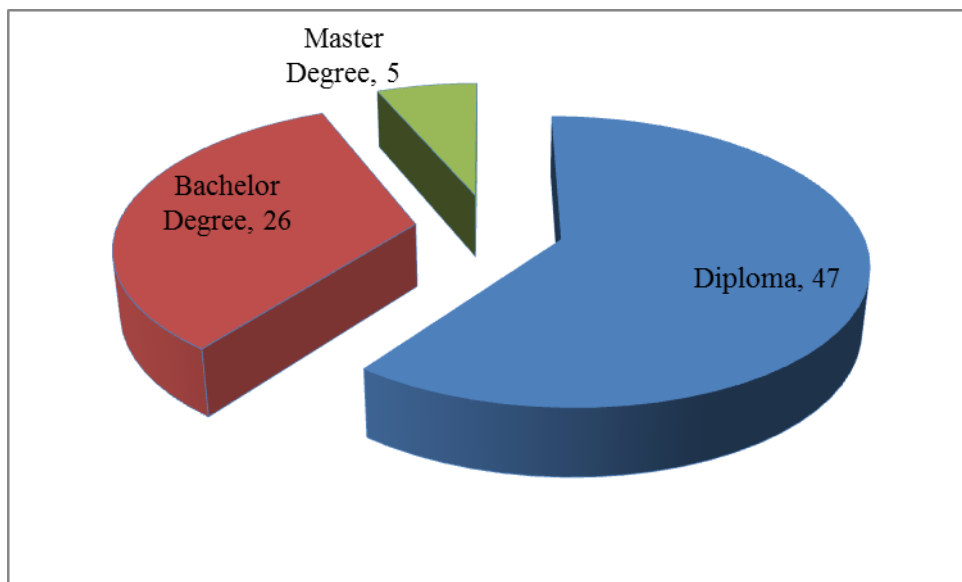


Figure 4.2 Frequency distribution of respondent's qualification (Part-I)

Table 4.4 Position of respondents in public projects (Part-I)

Respondent's Position	Frequency	Percentage
Chief Engineer	1	1%
Project Manager	3	4%
Executive Engineer	9	12%

Deputy Executive Engineer	2	3%
Project Engineer	48	62%
Assistant Engineer	7	9%
Junior Engineer	8	10%
	78	100%

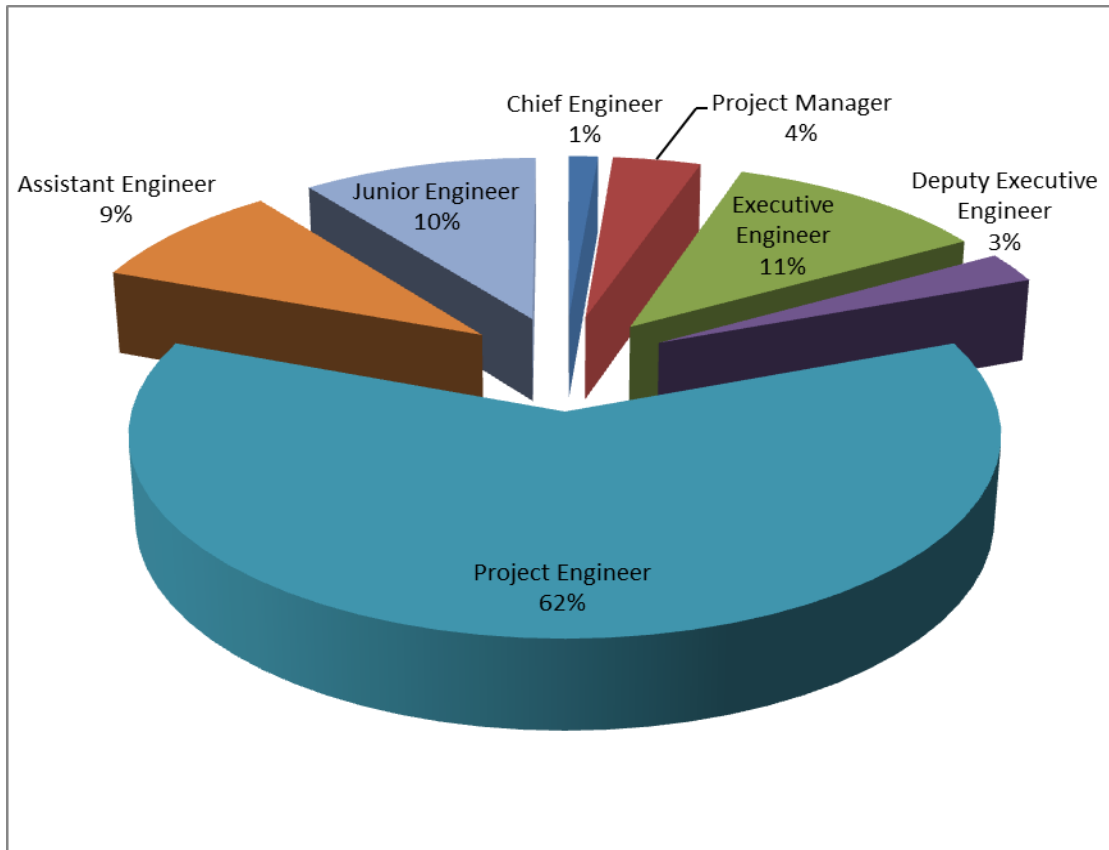


Figure 4.3 Percentage distribution of respondent's position (Part-I)

4.1.4 Data Screening and treatment

It is important to check for accuracy and completeness of the data before starting to perform analysis. So, the collected information and data through questionnaire survey was screened using complete sample (N=78) to examine the correctness of the data entry, errors and missing values if any. The completeness and accuracy of the data was checked on random sample of 78 of the original data computerized. During the course of checking, it observed four missing data from public owner's perception and there no errors in contractor's part.

4.2 Identifying Public Owners and Contractor's Perception on Important Conflict Issues

Respondents were asked their perceptions on important conflict issues that were experienced by public owners and contractors during construction phase in public projects. The conflict issues were related to project time, cost, quality, safety, scope and project personnel and others. In actual practices, some conflict issues had different perceptions by public owners and contractors. In order to know their different levels of perception, it separately focused on the conflict issues that public owners or contractors have agreed. Therefore, the first part of research analysis was based on the level of their agreement on important conflict issues in public projects during construction. However, the mean value above 3.5 was considered for conflict issues which needed more attentions, whereby the conflict issues were further screened. The analysis interpreted from the degree of agreement on the conflict issues from the interval of 1 - 1.49 (Strong Disagree), 1.5 - 2.49 (Disagree), 2.5 - 3.49 (Neutral), 3.5 - 4.49 (Agree) and 4.5 – 5 (Strong Agree). The lower scale of rating mean value indicated disagreement on the importance of conflict issue, whereas the scale rating of mean values greater than cut-off value at 3.5 was considered as agreement to the conflict issues as important (Awakul and Agunlana, 2002; Tanin, 2012). Thus, the results of ranking the important conflict issues from their perception were represented in section 4.2.1 and 4.2.2 below.

4.2.1 Ranking Public Owner's Perceptions on Important Conflict Issues

This section describes about the ranking result of important conflict issues from public owner's perception. The result of owner's perception to select important conflict issues for evaluating conflict level in the next stage. The result revealed total of 24 important conflict issues from public owner's perception which are more agreed than cut-off mean value at 3.5. Table 4.5 below shows the ranking result of important conflict issues from public owner's perception. These 24 important conflict issues were further described in regards to main conflicts issues related to project time, cost, quality, safety, scope, personnel and others respectively.

Table 4.5: Ranking Results of Important Conflict Issues from Public Owner's Perception

Conflict Issues	Mean	Rank
Slow progress/performance by contractor is important conflict issue related to project time.	4.244	1
Poorly develop project planning and scheduling is important conflict issue related to project time.	4.222	2
Unclear/Incomplete technical specifications are important conflict issue related to project quality.	4.067	3
Inadequate quality testing facility is important conflict issue related to project quality.	4.067	4
Non-compliance with quality control/quality assurance system or processes is important conflict issue related to project quality.	4.044	5
Poor workmanship or rework due to non-compliance with methods and practices is important conflict issue related to project quality.	4.044	6
Inadequate supervision, regular inspection or verification on construction site is important conflict issue related to project quality.	3.933	7
An unforeseen underground condition is important conflict issue related to project scope.	3.933	8
Shortage or absence of competent technical, managerial or supervisory personnel at construction site is important conflict issue related to project personnel.	3.889	9
Use of low quality & cheap materials are important conflict issue related to project quality.	3.867	10
Late approval or permit from regulators is important conflict issue related to project time.	3.844	11
Non-compliance with occupational health & safety regulations is important conflict issue related to project safety.	3.778	12
Excessive variations of quantity such as requiring massive earth excavation are important conflict issue related to project scope.	3.756	13
Frequent change orders cause extra cost of work preparation or rework is important conflict issue related to project scope.	3.689	14
Pollution during constructions and affect to environment is important conflict issue related to environment.	3.689	15
Time extension due to design changes is important conflict issue related to project time.	3.644	16
Ambiguous instructions and unqualified/unskilled operators or workers are important conflict issue related to project quality.	3.644	17
Irresponsibility/ Lack of commitment/attitude & personality problem are important conflict issue related to project personnel.	3.644	18
Slow decision making by client is important conflict issue related to project time.	3.622	19
A different perception on work quality acceptance is important conflict issue related to project quality.	3.578	20
Lack of detail drawing is important conflict issue related to project quality.	3.556	21

No first aid & lifesaving appliance at construction site is important conflict issue related to project safety.	3.556	22
Frequent change orders causes uncontrolled project schedule is important conflict issue related to project scope.	3.533	23
An error in contract document & violating terms & conditions of contract is important conflict issue related to project contract.	3.533	24
Lack of clear information to address the price escalation index is important conflict issue related to project cost.	3.489	25
Owner acceleration of work progress by rushing activities causes poor quality of work is important conflict issue related to project quality.	3.456	26
Quantity errors in BOQ affect calculating work quantity for payment is important conflict issue related to cost.	3.446	27
Unrealistic cost negotiation for new items are important conflict issue related to project cost.	3.445	28
Delay of construction project due to material shortage is important conflict issue related to project time.	3.444	29
Time compensation for delay caused by external influence such as bureaucratic/ political/public interruptions is important conflict issue related to project time.	3.444	30
Long waiting time for drawing approval is important conflict issue related to project time.	3.444	31
Late payment by client is important conflict issue related to project cost.	3.444	32
Late handover and change the location of construction sites/areas is important conflict issue related to project time.	3.444	33
Time extension request (inadequately or not reflect to contract) for delays caused by adverse weather conditions and acts of god is important conflict issue related to project time.	3.422	34
Unclear debris and construction junks are important conflict issue related to project scope.	3.400	35
Use of outdated drawings and specifications are important conflict issue related to project quality.	3.378	36
Financial problems/bankruptcy of contractors caused delay in construction project is important conflict issue related to project time.	3.333	37
Employment of illegal labor (child labor) is important conflict issue related to project safety.	3.244	38
Delay of project schedule due to equipment shortages is important conflict issue related to project time.	3.222	39
Cost of Rework from non-sequencing work due to government or unexpected social events request is important conflict issue related to project cost.	3.156	40
Payment for overtime working due to urgency of government or unexpected social events is important conflict issue related to project cost.	2.956	41

4.2.1.1 Important Conflict Issues related to Time from Public Owner's Perception

Table 4.6 below shows the ranking result of important conflict issues related to project time from public owner's perception.

Table 4.6: Ranking of Important Conflict Issues related to Time from Public Owner's Perception

Conflict Issues related to Time	Mean	Rank
Slow progress/performance by contractor is a conflict issue related to time	4.244	1
Poorly develop project planning and scheduling is a conflict issue related to time	4.222	2
Late approval or permit from regulators (road permit, environmental clearance, building, municipal permit etc.) is a conflict issue related to time	3.844	3
Time extension due to design changes is a conflict issue related to time	3.644	4
Slow decision making by client is a conflict issue related to time	3.622	5

The first ranked agreed by public owner is the "Slow progress/performance by contractor is a conflict issue related to time" with mean value of 4.244. It has obtained a high value, which means it has high agreed on this conflict issue. The reason is that the public owner has experienced with contractors that performed very slow in progress. In one of the school construction project, the contractor had delayed more than 100 days and beyond the liquidity damages of 10% (PO17). The contractor did not accelerate the progress despite the owner's repeated reminders and support. In the process the public owner had withhold the payment and suspended the project. The public owner had also retained 20% of the bid amount from contractor for carrying out the incomplete works (PO3). Second ranked is the, "Poorly develop project planning and scheduling" with mean value of 4.222. The owners have also agreed on this conflict issue because the public owners have unable to monitor the project activities according to contractor's plan and schedule. In the process, the owner had confused with the work activities and progress of the works being carried out at site because the contractor had never produced updated project plan and scheduling

process on time. As a result the project had met with deviations, claims and delay (PO3 and PO9).

Third is the “Late approval or permit from regulators” with mean value of 3.884. The public owners have agreed on this conflict issue since this has affected the normal progress of the works. During project delay, the public owners had difficult to settle with contractors regarding hindrances and wastage of resources for being remain idle of labors and machines. This has commonly experienced in infrastructures development projects when it had run under inadequate project duration, involvement with several stakeholders, public interruptions and requirement of many approvals and permits such as from municipal, power, telecom, environment, roads etc. For instance, this was experienced by public owner (PO11 and PO12) typically during construction of access roads in urban area in Thimphu in the year 2009 and the project had been delayed inexcusably beyond three months. Fourth, “Time extension due to design changes” has the mean value of 3.644. The design changes had led to additional works and reworks requiring time extension. The time extension granted by public owner has not been realistic to contractor against the amount of work done following the design changes and subsequently delayed the project (PO2 and PO12). Fifth issue is the, “Slow decision making by client” with mean value of 3.622. This issue had also agreed because the public owners had not received timely decision to be made at site regarding any changes or modifications. When there were slow decisions from client and committee, it had led to long waiting for the decision to get approval, affected the normal scheduled activities and time overrun (PO13). As a result the public owner had experienced irrational claims and blame game situation when the project was delayed.

4.2.1.2 Important Conflict Issues related to Quality from Public Owner’s Perception

Table 4.7 below shows the summary of mean values and ranking of conflict issues related to project quality from public owner’s perception. There are total of 9 conflict issues related to project quality.

Table 4.7: Ranking of Important Conflict Issues related to Quality from Public Owner's perceptions

Conflict Issues related to Quality	Mean	Rank
Unclear/Incomplete technical specifications is conflict issue related to quality	4.067	1
Inadequate quality testing facility is conflict issue related to quality	4.067	1
Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality	4.044	2
Poor workmanship or non-compliance with methods and good practices is conflict issue related to quality	4.044	2
Inadequate supervision, regular inspection or verification on construction site by client engineers is conflict issue related to quality	3.933	3
Use of low quality & cheap materials is conflict issue related to quality	3.867	4
Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality	3.644	5
A different perception on work quality acceptance is conflict issue related to quality	3.578	6
Lack of detail drawing is conflict issue related to quality	3.556	7

The first ranked issues are “Unclear/Incomplete technical specifications” and “Inadequate quality testing facility” with mean value of 4.067. The public owners have high agreed to these conflict issues. The public owner (PO3, PO12 and PO21) mentioned that it was not satisfied with the quality of work because contractors had failed to follow the specifications. The quality of complete structure for road works were found very poor when contractor had not able to build road in accordance to specifications (PO41, PO42 and PO43) and due to inadequate quality testing facility in the country. Without adequate and good quality testing facilities, the public owner (PO12) said contractor failed to perform density and compaction testing for construction of airport runways. As result the poor quality of pavement had rejected and deferred the bill payment by public owners. The conflict issues of “Non-compliance with quality control/quality assurance system or processes” and “Poor workmanship or non-compliance with methods and good practices” were the second ranked issues with mean value of 4.044. These two issues were also agreed by public owners as important conflict issue because the quality of the works was affected when contractors were not complied with QAS/QAP and performed poor workmanship (PO2, PO3, PO5 and PO43).

Third conflict issue is the “Inadequate supervision, regular inspection or verification on construction site by client engineer” with mean value of 3.933. The public owner have agreed to this issue because there had no regular supervision and verification by client engineers and resulted in poor quality of works. As a result it had become the blame game situation over quality and consequential impacts when the poor quality work had not been accepted by the technical committee members (PO5, PO18 and PO43). The fourth position, “Use of low quality & cheap materials” has been agreed with mean value of 3.867 by public owners. The public owners wanted to meet the products as prescribed but it has observed difficult to control the quality of construction materials brought at site. For instance, the public owner (PO12) mentioned that the poor quality of airport runway was due to use of sand and river boulders instead of using properly graded materials and without proper compaction. As a result the contractor’s poor quality work done had rejected and suspended the work. Therefore, the conflict between public owner and contractor had occurred when the low quality materials used in construction were made to remove (PO15). Fifth, is the “Ambiguous instructions and unqualified/unskilled operators or workers” with mean value of 3.644. This has also agreed as important conflict issue by owner because the owner doesn’t see any explicit instructions given by contractor with adequate knowledge and experiences to workers and operators. In addition, the tasks performed by unskilled workers were not satisfied by owner and made to do lots of reworks (PO12 and PO17).

The sixth position is “A different perception on work quality acceptance” with mean value of 3.578. A quality means to different perspectives however it should be complied with specifications and quality standards. It had controversial issues on handing/taking over a completed road work regarding the pavement quality despite contractor had done numerous reworks for accepting the work by committee (PO12 and PO17). The seventh conflict issue is the “Lack of detail drawing” with mean value of 3.556. This conflict issue is imperative because without having detail drawing had led to false works and poor quality works where the owner had disagreed with the contractor during construction. For instance, without having detail drawing

for prefabricated window components to be fit in concrete walls and windowsills had caused structural weakness and poor quality of completed structure (PO 34).

4.2.1.3 Important Conflict Issues related to Safety from Public Owner's Perception

Table 4.8 below shows the summary of mean values and ranking of conflict issues related to project safety from public owner's perceptions.

Table 4.8: Ranking of Important Conflict Issues related to Safety from Public Owner's Perceptions

Conflict Issues related to Safety	Mean	Rank
Non-compliance with occupational health & safety regulations is conflict issue related to safety	3.778	1
No first aid & lifesaving appliance at construction site is conflict issue related to safety	3.556	2

The first conflict issue is the "Non-compliance with occupational health & safety regulations" with mean value of 3.778. It has high agreed by public owner because it had found contractor do not complied with OHS regulations and accident occurred at site. It had injured three laborers and one death at site (PO39). Second issue is the "No first aid & lifesaving appliance at construction site" with mean value of 3.556. When accidents occurred and injured three laborers at site, the public owner had found the laborers had not used safety gadgets during working hours. Moreover the owner had found no first aid and appliances being prepared by contractor at site (PO39).

4.2.1.4 Important Conflict Issues related to Scope from Public Owner's Perception

Table 4.9 below shows the summary of mean values and ranking of conflict issues related to project scope from public owner's perceptions.

Table 4.9: Ranking of Important Conflict Issues related to Scope from Public Owner's Perceptions

Conflict Issues related to Scope	Mean	Rank
An unforeseen underground condition is conflict issue related to scope	3.933	1
Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope	3.756	2
Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope	3.689	3
Frequent change orders causes uncontrolled project schedule is conflict issue related to scope	3.533	4

First is the “An unforeseen underground condition” with mean value of 3.933. It had a high agreement on this conflict issue by public owners because they faced difficulties with contractor to quantify actual scope of works and more variations (PO26 and PO38). As a result some contractors play with the quantities due to scope changes and claimed for time and cost and deliberately delay the work progress (PO44). Second is the “Excessive variations of quantity such as requiring massive earth excavation” with mean value of 3.756. This conflict issue is also agreed by public owners as high important because they had experienced 10% to 20% additional works due to massive earth excavation and uncompromised with contractor regarding variation of scope, time and cost applicable (PO44). The third issue is the, “Frequent change orders causes extra cost of work preparation or rework” with mean value of 3.689 and the fourth issue is the “Frequent change orders causes uncontrolled project schedule” with mean value of 3.533. The owner has agreed to these issues because the public owners (PO7, PO12 and PO24) had faced more than 20% variations from original scope of works and 40% in schedule shift. This had difficult to negotiate on extra cost involved with contractor and moreover the tender committee was not favor in approving the variations and cost involved.

4.2.1.6 Important Conflict Issues related to Personnel and others from Public Owner's Perception

Table 4.10 below shows the summary of mean values and ranking of conflict issues related to project personnel and others from public owner's perceptions. First is

the “Shortage or absence of competent technical, managerial or supervisory personnel at construction site” with mean value of 3.889. This issue has been agreed by public owners because the owner had experienced failure of project without good management and controlled of the project by competent manager and supervisor at site (PO7 and PO19). The project has not been taken over by the department for more than one year as the concrete works in structural columns and beams were seen crooked in their alignment which was supervised by incompetent personnel and poor workmanship (PO39). Second is the “Pollution during constructions and affect to environment” with mean value of 3.689. The public owner found contractor did not comply with environmental rules and regulations. These had affected to environment and polluted with dusts and noise in vicinity, damage to properties and endangered public life.

Table 4.10: Ranking of Important Conflict Issues related to Personnel and others from Public Owner’s Perceptions

Conflict Issues related to Personnel and others	Mean	Rank
Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel	3.889	1
Pollution during constructions and affect to environment is conflict issue related to environment	3.689	2
Irresponsibility/ Lack of commitment/attitude & personality problem is conflict issue related to personnel	3.644	3
An error in contract document, violating terms & conditions of contract is conflict issue related to contract	3.533	4

Third is the “Irresponsibility/Lack of commitment/attitude & personality problem” with mean value of 3.664. This is important one because public owner feels that committed person are required for successful completion of projects. The irresponsible client engineer had not supervised properly at site and also delayed the quantity measurement and payment on time (PO10). As a result the owner had not paid the final bill and forfeited the 10% retention money. The fourth ranked is “An error in contract document, violating terms & conditions of contract” with mean value of 3.533. The public owners mentioned that this conflict issue was the main reasons for every conflict with contractor during construction. The contractor had deviated

and taken advantage from the terms and conditions of contract by avoiding the arrangement of required manpower and other resources as agreed in tender document (PO10 and PO33). As a result the public owner had deducted lump sum amount from the contractor bill which made contractor to refute over unclear contract terms.

4.2.2 Ranking Contractor's Perceptions on Important Conflict Issues

The data received from 33 contractors were analyzed to determine important conflict issues from contractor's perception to select for evaluation. The result found 17 important conflict issues are greater than cut-off value at 3.5. Found Table 4.11 below presents the summary ranking of important conflict issues from contractor's perception. These 17 important conflict issues are further described in subsequent sections in regards to main conflict issues related to project time, cost, quality, safety, scope, personnel and others respectively.

Table 4.11: Ranking Result of Important Conflict Issues from Contractor's perceptions

Conflict Issues	Mean	Rank
Lack of detail drawing is conflict issue related to quality	4.242	1
No first aid & lifesaving appliance at construction site is conflict issue related to safety	3.909	2
Slow decision making by client is conflict issue related to time	3.788	3
Non-compliance with occupational health & safety regulations is conflict issue related to safety	3.788	4
Lack of clear information to address the price escalation index is conflict issue related to cost	3.750	5
Poorly develop project planning and scheduling is conflict issue related to time	3.727	6
Late payment by client is conflict issue related to cost	3.697	7
A different perception on work quality acceptance is conflict issue related to quality	3.697	8
Unclear/Incomplete technical specifications is conflict issue related to quality	3.667	9
Inadequate supervision, regular inspection or verification on construction site at client engineer is conflict issue related to quality	3.667	10
Irresponsibility/ Lack of commitment/attitude & personality problem is conflict issue related to personnel	3.636	11

Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope	3.606	12
Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality	3.576	13
An error in contract document & violating terms & conditions of contract is conflict issue related to contract	3.576	14
Time extension due to design changes is conflict issue related to time	3.545	15
Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality	3.515	16
Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope	3.515	17
Pollution during constructions and affect to environment is conflict issue related to environment	3.455	18
Delay of construction project due to material shortage is conflict issue related to time	3.424	19
Long waiting time for drawing approval is conflict issue related to time	3.424	20
Payment for overtime working due to urgency of government or unexpected social events is conflict issue related to cost	3.424	21
Use of outdated drawings and specifications is conflict issue related to quality	3.424	22
Owner acceleration of work progress by rushing activities causes poor quality of work is conflict issue related to quality	3.424	23
Time extension request for delays caused by adverse weather conditions and acts of god is conflict issue related to time	3.394	24
Late approval or permit from regulators is conflict issue related to time	3.364	25
Financial problems/bankruptcy of contractors caused delay in construction project is conflict issue related to time	3.344	26
Unrealistic cost negotiation for new items is conflict issue related to cost	3.273	27
Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel	3.273	28
Late handover and change the location of construction sites/areas is conflict issue related to time	3.212	29
Slow progress/performance by contractor is conflict issue related to time	3.152	30
Quantity errors in BOQ affect calculating work quantity for payment is conflict issue related to cost	3.152	31
Time compensation for delay caused by external influence such as bureaucratic/ political/public interruptions is conflict issue related to time	3.121	32
Delay of project schedule due to equipment shortages is conflict issue related to time	3.121	33

Cost of Rework from non-sequencing work due to government or unexpected social events request is conflict issue related to cost	3.091	34
Use of low quality & cheap materials is conflict issue related to quality	3.091	35
Inadequate quality testing facility is conflict issue related to quality	3.091	36
Frequent change orders causes uncontrolled project schedule is conflict issue related to scope	3.091	37
Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality	3.061	38
Unclear debris and construction waste is conflict issue related to scope	2.970	39
Employment of illegal labor (child labor) is conflict issue related to safety	2.909	40
An unforeseen underground condition is conflict issue related to scope	2.818	41

4.2.2.1 Important Conflict Issues related to Time from Contractor's Perception

The summarized mean values and ranks for all items of important conflict issues related to project time from contractor's perception are shown in table 4.12 below.

Table 4.12: Ranking of Important Conflict Issues related to Time from Contractor's Perception

Conflict Issues related to Time	Mean	Rank
Slow decision making by client is conflict issue related to time	3.788	1
Poorly develop project planning and scheduling is conflict issue related to time	3.727	2
Time extension due to design changes is conflict issue related to time	3.545	3

The first ranked is the "Slow decision making by client" with mean value of 3.788. The contractor has agreed to this conflict issue because it had delayed the project by one month when the material delivered late at site. It occurs due to client's slow client's decision on specific requirement of material changes from concretes to the second class brick (C5 and C23). The second issue is the "Poorly develop project planning and scheduling" with mean value of 3.727. Perceptibly, this issue is also agreed high because the work had delayed more than three months without proper

planning and scheduling. As a result the owner had imposed penalty inexcusably for the delay (C5). The third issue is the “Time extension due to design changes” with mean value of 3.545. The contractor has agreed because design changes are the most frequent issues of conflict. The owner has inadequately granted time extension for frequent changes and delayed the project (C5, C15 and C29).

4.2.2.2 Important Conflict Issues related to Cost from Contractor’s Perception

Table 4.13 below shows the summary of mean values and rank of items in the context of conflict issues related to project cost from contractor’s perceptions.

Table 4.13: Ranking of Important Conflict Issues related to Cost from Contractor’s Perception

Conflict Issues related to Cost	Mean	Rank
Lack of clear information to address the price escalation index is conflict issue related to cost	3.750	1
Late payment by client is conflict issue related to cost	3.697	2

First ranked is the “Lack of clear information to address the price escalation index” with mean value of 3.750. This issue has been agreed by contractor as the escalated prices had not able to calculate with appropriate standards. Moreover, it did not satisfy the actual payment made by owner for project duration of more than 12 months (C20, C27 and C32). Second is the “Late payment by client” with mean value of 3.697. The contractors had not received payment on time from owner for more than two months. As a result it had not able to expedite the work progress and delayed payment to laborers and suppliers for materials procurement (C16 and C27).

4.2.2.3 Important Conflict Issues related to Quality from Contractor’s Perception

Table 4.14 below shows the summary of mean values and ranking of conflict issues related to project quality from contractor’s perceptions.

Table 4.14: Ranking of Important Conflict Issues related to Quality from Contractor's Perception

Conflict Issues related to Quality	Mean	Rank
Lack of detail drawing is conflict issue related to quality	4.242	1
A different perception on work quality acceptance is conflict issue related to quality	3.697	2
Unclear/Incomplete technical specifications is conflict issue related to quality	3.667	3
Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality	3.667	3
Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality	3.576	4
Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality	3.515	5

First ranked conflict issue related to quality is the “Lack of detail drawing” with mean value of 4.242. The contractor (C18) mentioned the owner did not produce detail drawing and workers had to construct the structures with unclear drawings. The works were built by workers based on assumptions and little past experiences but the quality of work was not accepted by owner. The detail drawing for GRC (glass reinforced concrete) window components has not provided by owner. This situation had led to lots of impacts to concrete walls and beams that made structures weak and affect quality finishes (C18 and C25). The second issue is the “A different perception on work quality acceptance” with mean value 3.697. This conflict issue is also agreed by contractor because the contractor had experienced with owner who strictly points to even minor variations and cracks in structures. As a result the owner and committee rejected the project during final inspection (C25).

The third issues are the “Unclear/Incomplete technical specifications” and “Inadequate supervision, regular inspection or verification on construction site by client engineer” with mean value of 3.667. Both of these conflict issues are agreed by contractor because the technical specifications prepared by owner were incomplete. It affects to the quality as it has unable to work with prescribed specification and in absence of clear instructions. The workers had laid base course for road works and pavement thickness as required. But soon after its completion it had started developing cracks, unevenness and pothole. As a result, the owner had not accepted

the quality of works and suspended the project (C27). The irregular or inadequate supervision by client engineers are also agreed by contractor because it had made mistakes in construction and led to poor quality of works (C27). Fourth is the “Poor workmanship or rework due to non-compliance with methods and good practices” with mean value of 3.576. The fifth ranked is the “Ambiguous instructions and unqualified/unskilled operators or workers” conflict issue with mean value of 3.515. Contractor has agreed that current practices and methods were done by unskilled workers which lead to rework or poor workmanship. The poor workmanship and reworks formed cracks in concrete columns and walls, the curved alignment of beams and developed honey combs in concrete works. Such workmanship and quality of works was not accepted by public owner (C16).

4.2.2.4 Important Conflict Issues related to Safety from Contractor’s Perception

Table 4.15 below shows the summary of mean values and ranking of conflict issues related to project safety from contractor’s perceptions. First conflict issue is the “No first aid & lifesaving appliance at construction site” with mean value of 3.909. The contractors had agreed to this issue regarding safety during construction because lack of first aid and lifesaving appliances had caused more casualties and affected to project when three Indian laborers were severely injured (C7).

Table 4.15: Ranking Important Conflict Issues related to Safety from Contractor’s Perception

Conflict Issues related to Safety	Mean	Rank
No first aid & lifesaving appliance at construction site is conflict issue related to safety	3.909	1
Non-compliance with occupational health & safety regulations is conflict issue related to safety	3.788	2

Second is the “Non-compliance with occupational health & safety regulations” with mean value of 3.788. The owner and implementing agency strictly enforces the contractor to comply with OHS regulations. Despite of that contractors are still difficult to adapt at present moment when it has just started to sensitize with

regulations. However, this issue is also agreed by contractors that they have realized only after the accidents occurred at site due to collapse of scaffoldings and work benches during construction injuring three laborers and one death (C7 and C19).

4.2.2.5 Important Conflict Issues related to Scope from Contractor's Perception

Table 4.16 below shows the summary of mean values and ranking of important conflict issues related to project scope from contractor's perceptions.

Table 4.16: Ranking Important Conflict Issues related to Scope from Contractor's Perception

Conflict Issues related to Scope	Mean	Rank
Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope	3.606	1
Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope	3.515	2

First ranked is the "Excessive variations of quantity such as requiring massive earth excavation" with mean value of 3.606. Contractor has agreed to this issue because this issue causes extra items and deviations that are required time extension and extra cost to be arranged by owner. This issue was not easy to settle amicably (C13). It also involved with additional works and required additional resources such as laborers and machines at site in which owner never takes into such accounts and delayed the project (C15). Moreover, the owner had not paid for the earthwork quantity for the actual excavation work for school construction site (C2). Second is the "Frequent change orders cause extra cost of work preparation or rework" with mean value of 3.515. The frequent change orders had caused changes to original scope of works involving time and payment issue. Frequent change orders by public owner had increased scope of work by 16% but the payment and time didn't covered for extra resources involved for the work (C15).

4.2.2.6 Important Conflict Issues related to Personnel and others from Contractor's Perception

Table 4.17 below shows the summary of mean values and ranking of conflict issues related to project personnel and others from contractor's perception. First ranked is the "Irresponsibility/ Lack of commitment/attitude & personality problem" with mean value of 3.636. Contractors agreed that this issue is related to project personnel because irresponsible engineers had delayed the payment more than two months and showed lack of commitment to verify at site on time (C13, C17 and C28). It had also led to communication problems and breakdown in relationship between contractor and public owner (C28).

Table 4.17: Ranking Important Conflict Issues related to Personnel and others from Contractor's Perception

Conflict Issues related to Personnel and others	Mean	Rank
Irresponsibility/ Lack of commitment/attitude & personality problem is conflict issue related to personnel	3.636	1
An error in contract document, violating terms & conditions of contract is conflict issue related to contract	3.576	2

Second is the "An error in contract document and violating terms & conditions of contract" with mean value of 3.576. This conflict issue has agreed by contractor because public owner had imposed fine and deducted lump sum amount (Nu.30,000 to 50,000 per month for engineers and prevailing hiring charges of machines) from the contract bill for not employing full time engineers, supervisors at site and for non-availability of required machines at site (C27 and C28). The contractor (C28) mentioned that such clauses are not adequately reflected in the contract and moreover engineers cannot be full time of 24hours at the construction site.

4.3 Independent-Samples T-Test Analysis Result

This research also attempted to check whether the public owners and contractor's perceptions on important conflict issues have different level of opinion.

To determine this, the independent-samples t-test analysis was performed at 5% significance level for the validation of agreement by both groups in order to get the implication of the survey. This was conducted for 26 important conflict issues that were selected for next phase of evaluation for conflict level. These 26 important conflict issues (24 from public owners, 17 from contractors and 15 common) were obtained from both public owners and contractor's perception. The test results are attached in the appendix B.

The output from independent-samples t-test was interpreted by checking the significance level for Levene's test which is 0.05 as cut-off value having verified whether assumption of equal variances has been violated or not. Then to know whether there is a significant difference between public owners and contractors, it was referred to sig. (2-tailed). From labeled Sig. (2-tailed), the values having less than 0.05 was considered to have significant differences in the mean score and values above 0.05 were considered as there are no significant differences between them. It concluded that 11 important conflict issues have significant differences and 15 of them have similar in public owners and contractor's perception.

However the important conflict issues that have similar in their perceptions of two groups are such as: Inadequate supervision, regular inspection or verification on construction site is conflict issue related to project quality (Sig=0.236), Non-compliance with occupational health & safety regulations is conflict issue related to project safety (Sig=0.954), No first aid & lifesaving appliance at construction site is conflict issue related to project safety (Sig=0.096), Slow decision making by client is conflict issue related to project time (Sig=0.46), Excessive variations of quantity such as requiring massive earth excavation are conflict issue related to project scope (Sig=0.434), Late approval or permit from regulators is conflict issue related to project time (Sig=0.06), Irresponsibility/ Lack of commitment/attitude & personality problem are conflict issue related to project personnel (Sig=0.966), A different perception on work quality acceptance is conflict issue related to project quality (Sig=0.531), Frequent change orders cause extra cost of work preparation or rework is conflict issue related to project scope (Sig=0.450), Time extension due to design

changes is conflict issue related to project time (Sig=0.676), Lack of clear information to address the price escalation index is conflict issue related to project cost (Sig=0.481), Ambiguous instructions and unqualified/unskilled operators or workers are conflict issue related to project (Sig=0.542), Pollution during constructions and affect to environment is conflict issue related to environment (Sig=0.192), Late payment by client is conflict issue related to project cost (Sig=0.241), An error in contract document & violating terms & conditions of contract is conflict issue related to project contract (Sig=0.807).

On the other hand, the important conflict issues that has differences in the perceptions are: Lack of detail drawing is conflict issue related to project quality (Sig=0.003), Slow progress/performance by contractor is conflict issue related to project time (Sig=0.000), Poorly develop project planning and scheduling is conflict issue related to project time (Sig=0.021), Unclear/Incomplete technical specifications are conflict issue related to project quality (Sig=0.018), Inadequate quality testing facility is conflict issue related to project quality (Sig=0.000), Non-compliance with quality control/quality assurance system or processes is conflict issue related to project quality (Sig=0.000), Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to project quality (Sig=0.010), An unforeseen underground condition is conflict issue related to project scope (Sig=0.000), Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to project personnel (Sig=0.014), Use of low quality & cheap materials are conflict issue related to project quality (0.002), Frequent change orders causes uncontrolled project schedule is conflict issue related to project scope (Sig=0.009).

4.4 Summary

This chapter has mainly discussed in detail about the identification of public owners and contractor's perception on important conflict issues in public projects. First it discussed about the surveyed data and respondent's profile. Then it discussed about how the collected data were check for inclusiveness and correctness to ensure

suitable for analysis. Next, it explained about separate analysis from public owners and contractor's perception on important conflict issue. Accordingly, the results confirmed total of 26 important conflict issues. The 26 important conflict issues included 24 from public owner's perception and 17 from contractor's perception. It found 15 important conflict issues that are common from both the groups. However the level of agreement from owner's perception was relatively high agreed than contractor's perception. These results were discussed from both perceptions on important conflict issues related to project time, cost, quality, safety, scope, personnel and others. In addition combined analysis was also performed for 26 selected important conflict issues to see whether the level of perceptions from two groups has significant different level of opinion. The analysis has revealed 11 significant difference conflict issues and 15 conflict issues that have similar in their perceptions.

CHAPTER V

EVALUATING LEVEL OF CONFLICTS IN PUBLIC PROJECTS FROM PUBLIC OWNERS AND CONTRACTORS

This chapter focuses on evaluating level of conflict in public projects from public owners and contractors. First, it begins with the description of survey data that were collected through questionnaire survey including their response rate; respondent's working experiences, positions and qualification. Then the evaluated data were checked for accuracy and completeness to ensure suitability for analysis. Second it explains about analysis and computation of conflict level. Third it explains about the results of conflict levels from public owners and contractors separately. Next, it focuses on the explanation of conflict issues based on distribution of conflicts at various levels against its occurrences after it is grouped into conflict issues related to project time, cost, quality, safety, scope, project personnel and others. All the explanations are supplemented by respondent's actual field experiences and comments given during the evaluation stage. Finally, it discusses about the results.

5.1 Description of Survey data

Data were collected in the month of mid-February and March, 2013 in Bhutan. The questionnaires were distributed personally to each person and they were explained about the concepts and main purposes of the research. The focus of the study was not industry level, but rather on the public construction project level. Therefore, the distribution of questionnaire was not so extensive in general, non-discriminate in a sense, rather was highly particular. The sample size was determined from practical concerns as tempered by the local project natures and peculiarities of the respondents. However, each and every respondent was interviewed in person regarding with their experience on the conflict issues. The causes of conflict issues and appropriate solutions were collected from their experience while undertaking the public projects. This action was to reduce the misinterpretations while evaluating the level of conflicts and also to increase the rate of responding to the questionnaire.

5.1.1 Response Rate

There were 60 questionnaires distributed to public owners and contractors during the second part of evaluation process. At last, there were 49 questionnaires collected making the response rate of 82% as shown in table 5.1. The respondents were mainly the public owners and the contractors and they are the major role players undertaking any public projects. It was focused on these two groups since conflict are mostly being faced between them during construction phase. The response from contractors (25 samples) was higher than public owners (24 samples) during the second phase. This was made possible with the respondents as they were made to understand the questions of evaluation process which was the main objective of this research. None of the response received from the respondents were rejected.

Table 5.1 Details of Questionnaires distribution and their responses (Part-II)

Weeks	Questionnaires distributed			Questionnaires received			Response Rate
	Total	PO	Con	Total	PO	Con	Overall
Week1	20	10	10	19	10	9	95%
Week2	10	5	5	9	4	5	90%
Week3	10	5	5	8	4	4	80%
Week4	10	5	5	8	4	4	80%
Week5	10	5	5	5	2	3	50%
Total	60	30	30	49	24	25	82%

5.1.2 Respondent's working experience and Competence

Personal experiences in the construction field may enable them to evaluate the conflict issues more realistically. Thus, this research on evaluation phase of survey was targeted on experienced and more competent persons involved in the construction projects. The respondents selected for this evaluation was focused on large contractors registered with Construction Development Board (CDB) of Bhutan and they are permitted to work more than 15Million Ngultrum for a project. However the personal experience varies from 1 year to more than 10 years which were classified into three categories as shown in table 5.2 below. The respondents experiences varies such as

21% of public owners and 0% of contractors having less than 5 years of working experience; 38% of public owners and 40% of contractors having 5-10 years of working experiences; and 42% of public owners and 60% of contractors having working experience of more than 10 years. In overall, 18% of the respondents showed less than 5 years of working experiences, followed by 31% having working experience of 5-10 years and 51% of respondents having more than 10 years of working experience in construction. This shows that the participation by higher frequencies of respondents having more number of experiences in construction field would contribute more practicable views on evaluation of conflict issues.

Table 5.2 Respondent's experience in public projects (Part-II)

Experience	Public Owners		Contractors		Overall Frequency	Overall Percentage
	Freq	%	Freq	%		
Less than 5 years	9	38%	0	0%	9	18%
5-10 years	5	21%	10	40%	15	31%
More than 10 years	10	42%	15	60%	25	51%
Total	24		25		49	100%

5.1.3 Position and Qualification of Respondents

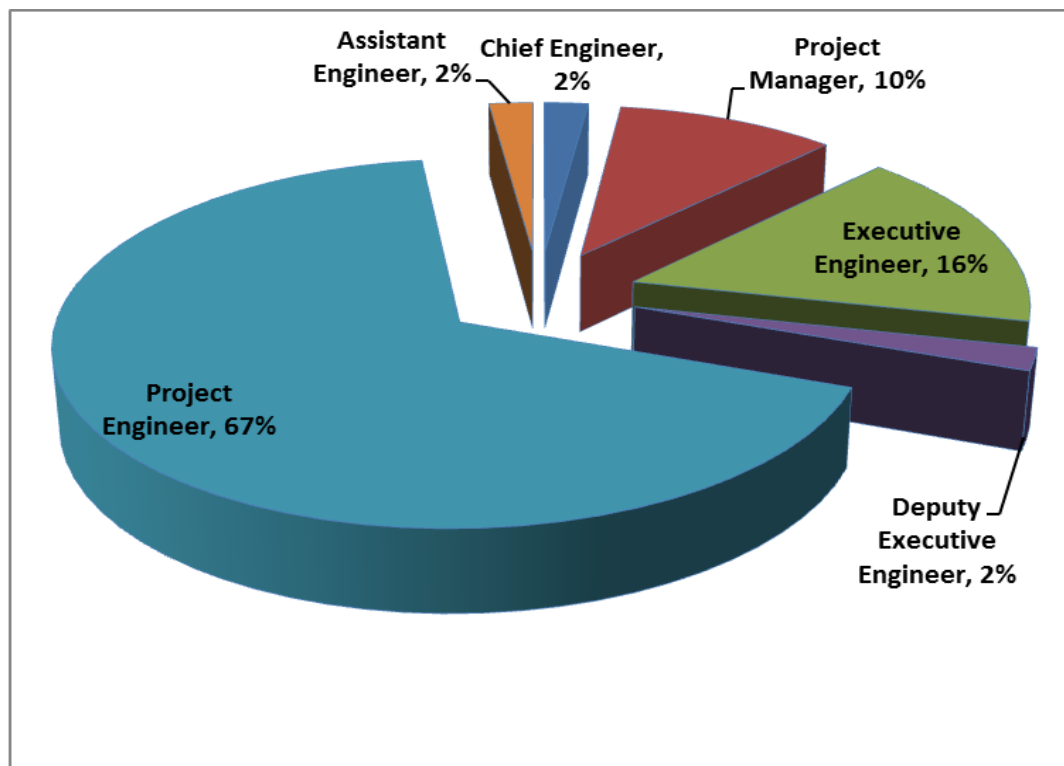
The qualification of respondents revealed in three categories those who participated in this second part of survey. It was evaluated by same respondents who were also represented in first part survey but with fewer frequencies this time due to inadequate time, lengthy and very specific process of evaluation. However, the maximum qualification of experienced public owners participated had bachelor degree (24), diploma (20) and 5 person had master degree in engineering as shown in table 5.3 below. The results of position of respondents are given in table 5.4 and figure 5.1 below. From the result of this research, 2% hold chief engineer, 10% project manager, 16% executive engineer, 2% deputy executive engineers, 67% project engineers and 2% assistant engineer.

Table 5.3 Respondent's qualification in public projects (Part-II)

Respondent's Qualification	Frequency	Percentage
Diploma	24	49%
Bachelor Degree	20	37%
Master Degree	5	14%
Total	49	100%

Table 5.4 Position of Respondent in public projects (Part-II)

Respondent's Position	Frequency	Percentage
Chief Engineer	1	2%
Project Manager	2	10%
Executive Engineer	8	16%
Deputy Executive Engineer	1	2%
Project Engineer	33	67%
Assistant Engineer	1	2%
	49	100%

**Figure 5.1 Percentage distribution of respondent's position (Part-II)**

5.2 Analysis Level of Conflicts

The verified data were the evaluation of conflict issues assessed by public owners and contractors. All collected data and information from the survey were checked and verified for their accuracy and completeness. The cleaned and completed data were then analyzed and computerized.

The public owners and contractors evaluated the level of conflicts in public projects on the scale from conflict level 1 (Very low) to level 5 (Very high). The five point scales used for evaluating conflict level was described as 1 (Very low) = Incompatibility, level 2 (Low) = Disagreement, level 3 (Moderate) = Antagonism, level 4 (High) = Frustration and level 5 (Very high) = Dispute. Respondents also rated the percentage of conflict occurrence at respective conflict level that measures the conflict concentration on their actual experiences during course of construction time. Therefore the conflict level for each issue was calculated from distribution of conflicts that occurred at respective levels. The method for calculating conflict level was $(W1)1.00 + (W2)2.00 + (W3)3.00 + (W4)4.00 + (W5)5.00$. The calculations of conflict level are described in Appendix C.

5.3 Result of Conflict Levels evaluated by Public Owners

After in-depth interview and evaluation of conflict level from public owners on 26 important conflict issues, the data was analyzed to determine the conflict levels. The result determines 21 critical conflict issues that have the conflict levels greater than cut-off value of 2.6. Table 5.5 shows the ranking of the conflict level in descending order. The description of conflict levels on each critical conflict issue is explained in the subsequent sections. All these explanations are supported by public owner's comments, experiences and knowledge on conflicts exchanged during the evaluation process.

Table 5.5 Result of Conflict Levels evaluated by Public Owners

Conflict Issues	Conflict Level	Rank
Use of low quality & cheap materials is conflict issue related to quality	3.081	1
Inadequate quality testing facility is conflict issue related to quality	3.035	2
Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality	3.021	3
Poorly develop project planning and scheduling is conflict issue related to time	2.975	4
Frequent change orders causes uncontrolled project schedule is conflict issue related to scope	2.960	5
Slow progress/performance by contractor is conflict issue related to time	2.946	6
Time extension due to design changes is conflict issue related to time	2.929	7
Late payment by client is conflict issue related to cost	2.900	8
An unforeseen underground condition is conflict issue related to scope	2.896	9
Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality	2.871	10
Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality	2.867	11
Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality	2.854	12
Non-compliance with occupational health & safety regulations is conflict issue related to safety	2.838	13
Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope	2.817	14
Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel	2.815	15
Slow decision making by client is conflict issue related to time	2.790	16
Lack of detail drawing is conflict issue related to quality	2.785	17
Lack of clear information to address the price escalation index is conflict issue related to cost	2.763	18
Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope	2.748	19
Irresponsibility/ Lack of commitment/attitude & personality problems is conflict issue related to personnel	2.746	20
Unclear/Incomplete technical specifications is conflict issue related to quality	2.700	21
Late approval or permit from regulators is conflict issue related to time	2.577	22
Pollution during constructions and affect to environment is conflict issue related to environment	2.575	23
Errors in contract document & violating terms & conditions of contract is conflict issue related to contract	2.563	24
No first aid & lifesaving appliance is conflict issue related to safety	2.529	25
Different perceptions on work quality acceptance is conflict issue related to quality	2.529	26

5.3.1 Evaluating Level of Conflicts in Public Projects from Public Owners

1. Level of Conflict for “Use of low quality & cheap materials is conflict issue related to quality”

The conflict level for this conflict issue was equal to 3.081. Public owner formed moderate level of antagonism. From the public owner's experiences on conflicts due to the use of low quality and cheap materials, it had started with 13.8% incompatibilities as shown in figure 5.2. The reason is that the construction materials are not readily available in domestic market so almost all of the construction materials for project had to be imported from neighboring border towns of India. These materials mostly duplicate and cheaper ones are mostly selected by contractors. The reason was that owner had difficulties to check and approve materials at site due to inadequate testing facilities (PO22). Moreover the contractors quoted low rates in tendering time to get the project and also being profit oriented, they ended up procuring low quality and cheap materials (PO1, PO4, PO9 and PO21). That's why the owner had incompatibilities at the beginning of the project itself. With these incompatibility issues, it had led to 18.3% disagreement with the contractors that made to occur at level 2. The disagreements occurred when public owner started to control the use of cheap materials at the worksite. In some cases, public owners (PO3 and PO18) had never noticed defective materials being delivered to site but in other projects, the public owner (PO9 and PO21) had done strict monitoring and had rejected defective materials brought at site.

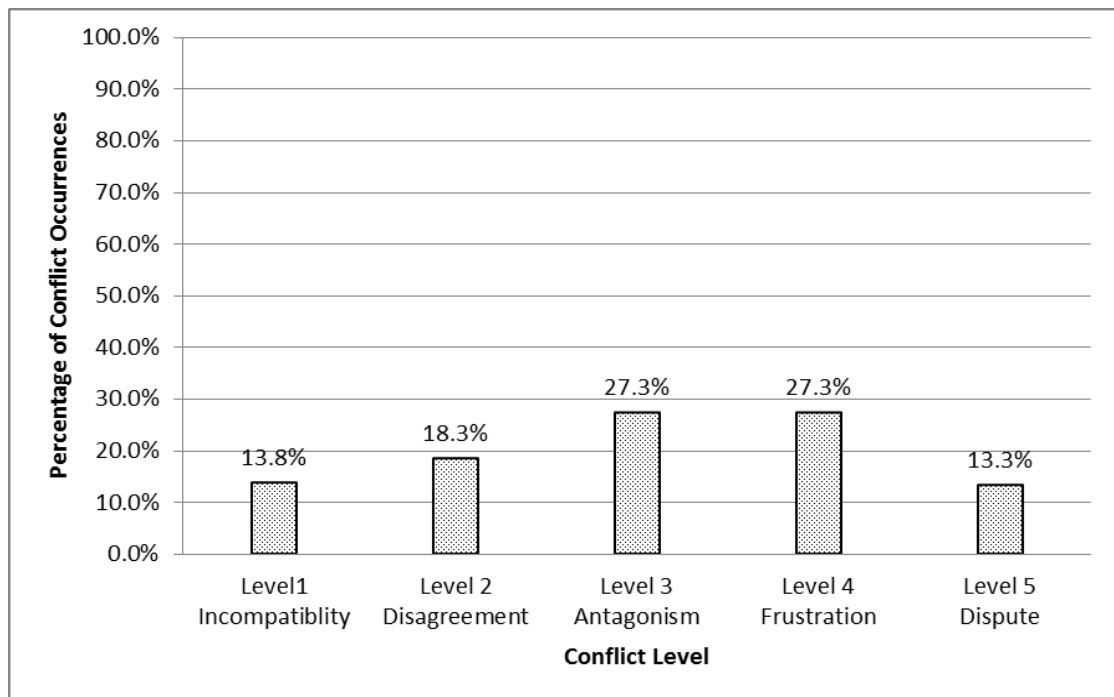


Figure 5.2: Conflict distribution on “Use of low quality and cheap materials”

When the low quality material was rejected, the conflict had occurred at level 3 around 27.3% indicating antagonisms and hatred situations. At such event, contractors were not happy when it had rejected several times because the debt with supplier has increased and affected the progress (PO12 and PO17). However, with the progress of works, owner sometimes had accepted and cooperated to continue works with the materials brought at site (PO18 and PO21). But this was not the case in all projects where the contractor had constructed the structures with low quality materials (PO14, PO15 and PO19). The public owners were frustrated when they have seen crooked workmanship and inferior materials being used despite of giving reminders and notifications to contractors. The labor contractors and his gangs were other parties who compromised on quality and deceived workmanship by substituting cheap and low quality materials (PO13, PO14 and PO22). In the event, the conflicts had occurred at level 4 when it had experienced 27.3% frustrations.

Moreover, the owner had observed already cracks formed in the structures and walls when the project was still ongoing (PO19 and PO12). Such circumstances had made lots of reworks and repairs done by contractors. On the other hand contractors

were frustrated and are not willing to reworks because of the extra cost incurred for change of materials, additional labor cost and equipment usage. By that time the project had also delayed and becomes difficult for contractor to complete the schedule and required quality as required (PO22). So therefore, it had occurred 13.3% dispute. The issues were withholding of bill payments, contractors unable to complete the work and delayed the project. This resulted in the suspension of construction project and disqualifying the contractor from future participation in projects (PO2, PO18 and PO21).

2. Level of Conflict for “Inadequate quality testing facility is conflict issue related to quality”

This conflict issue was experienced during construction phase by public owners in moderate level in a situation of antagonism. The average conflict level of inadequate quality testing facility was equal to 3.035. First, the conflict issue of inadequate quality testing facilities in the construction industry is due to centralized notion to have one central facility which is only available currently. Second is due to lack of non-destructive testing equipment and not enough qualified professionals. Third, there is no private sector involvement to set up such facilities (PO1, PO6, PO12 and PO24). In overall view, the conflict has begun with 14.0% incompatibilities with the issue of inadequate quality testing facility in public projects as shown in figure 5.3 below. The reasons are stated above. In addition, industry is not in a position to set up the facilities owing to the economic conditions (PO6 and PO24). So, the public owners had incompatibilities because testing facility is only located in one place where many tests cannot be done on time due to samples gathered from whole construction industry. In the process, the quality of work in most of the public projects had been affected right from the beginning till the very completion of the work (PO6, PO13 and PO24). This led to 20.6% disagreement by public owners when they found irregularities and lapses in the proceedings for testing the quality of materials. Public owners wanted to test the construction materials brought at site but the contractor refused by saying it's difficult to avail the service in the only available testing center. However, site engineers from public owners verified

quality at site based upon visual inspection, aptitude, past experience and compromised on the quality of materials. Correspondingly the public owners had also encouraged to do field tests such as slump test for concrete and etc. but contractor had not made any arrangements for conducting the test (PO6, PO13, PO20 and PO23). The public owner had also asked contractors to cast concrete cube samples at site and get it tested from the laboratory but it had not been easy as agreed. At some sites, they never practiced quality testing for materials as well as any concrete works as there were no quality testing facilities nearby (PO1 and PO13).

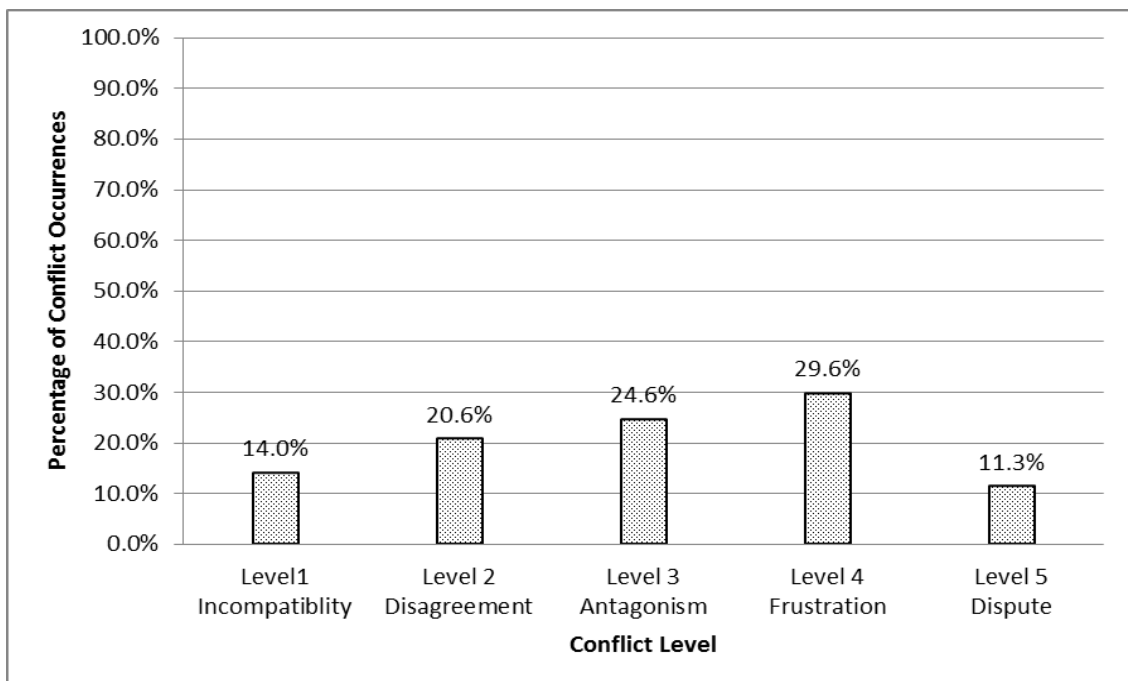


Figure 5.3: Conflict distribution on “Inadequate quality testing facility”

In the meantime, when the quality of works had become difficult to control, it had been complacent on what was being carried out by laborers. But the qualities of works were not satisfied by the owners (PO6). As a result, the conflicts as experienced by public owners had reached level 3 with 24.6% antagonisms and heated situations between the parties. Thus the public owner had instructed laborers to demolish and rectify when it has observed defects and poor work quality. With the reworks and having realized on wasting the resources, contractors had gone more aggressive as they had to bear additional cost beyond bid amount (PO13 and PO20).

Furthermore, the conflicts had escalated to level 4 without managing the earlier low level conflicts due to quality issues because of inadequate quality testing facilities. Public owners had evaluated 29.6% in frustrated situations especially when important structural testing required were not taken the cube samples for testing. As a result the public owners had temporarily suspended the works unless the required tests are performed as per the contract document (PO7, PO11, PO17 and PO23). The contractors were frustrated when owner had stopped the works and overturned on the absence of quality testing facility and difficulty in getting tested from the only available center (PO11 and PO23). The carryover of conflicts had further experienced in a disputed situation between the parties. The contractors had become enraged over the stoppage of works and started claiming time compensation for the delay. The contractors had claimed for extra works and materials utilized for reworks and rectifications (PO11 and PO23). In the event the public owner had stated that all such claims were irrelevant and unrealistic for any compensation and had been specific only to the quality of the work. The contractors were not able to continue the activities because the structure had structurally deviated and became contentious one as it involves risks of failure. The uncompleted project due to this issue intertwined from other related issues had not been able to resolve the conflicts between the parties and at last it had affected the relationship and reputation of the company. Finally, the owner had terminated the contract and the uncompleted project had been undertaken departmentally. Thus the owner had experienced 11.3% of conflict at level 5.

3. Level of Conflict for “Inadequate supervision, regular inspection on construction site by client engineer is conflict issue related to quality”

Overall, the conflicts experienced during construction phase by public owners were in moderate level of conflict in a situation of antagonism with average conflict level of 3.021. The distribution of conflicts at different levels with this issue is given in figure 5.4.

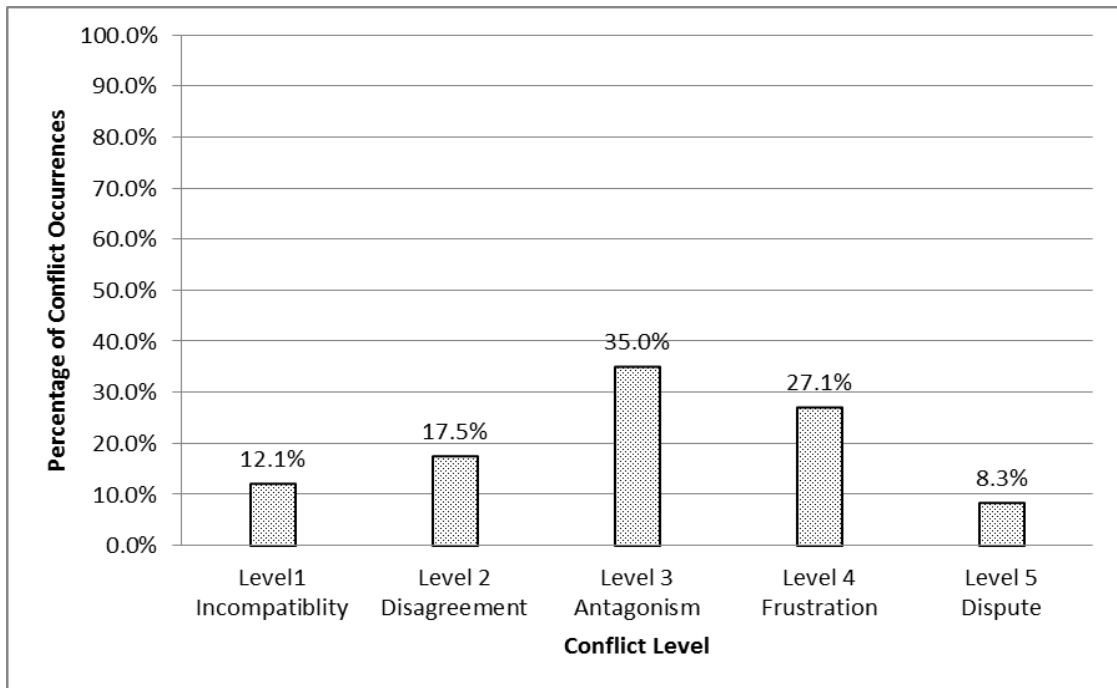


Figure 5.4: Conflict distribution on “Inadequate supervision, regular inspection or verification on construction site”

It had begun with 12.1% incompatibility with contractors during construction phase. The root causes for having incompatibility over this issue are due to lack of adequate staff to monitor the works, irresponsibility and lack of commitment by client engineers, shortage of skilled manpower especially engineers, lack of adequate training and knowledge in construction field, too many works at a time and overloaded, dispersed site and transportation problems, lack of management skills and communication problems (PO1, PO4, PO5 and PO24). With all these reasons it had led to inadequate supervision, irregular inspection and verification at site. These events affected the quality of the works. The laborers were not on a position to interpret drawings and specifications; as a result they had done based on their judgment when complete execution was left to their labor contractor (PO6, PO9 and PO24). But the quality of the works was not pleasing to the public owners when inspected once in a while. As a result the conflicts had increased to level 2 with 17.5% disagreements.

From the above figure, the owner had experienced 35% antagonistic situation with contractors. The quality of work has affected because the contractors had not deputed the site engineers and supervisors at construction site as agreed during tender and they just relied on client engineer's supervision and verification at site (PO2, PO8 and PO11). A weak point of personal assessment was that connections between contractor and client engineers had influenced decision and mood during control of quality of works. Mostly in remote construction, the relationship of supervisors with contractors had certainly affected the decisions during inspections and checking (PO14, PO20 and PO21). Such relationships had fostered through past project relationships, obligations, gratitude, power and influence and out of bribery (PO17, PO22 and PO23). In other projects, there was no qualified personnel at site and the labor gang leader (labor contractor) controlled the overall site even though they lacked the ability to interpret all of the drawings and specifications and contract documents. When public owners periodically inspect the site, the actions were only to make them work again in accordance to quality standards and good workmanship after it had observed deviations and lots of faulty constructions. At such times, contractors excused over manpower shortage and had tried to cooperate by giving lots of fault promises and even attempted to negotiate on personal matters (PO2 and PO12). But the contractors were not happy with reworks when it had incurred extra cost and times. Although this situation had tried to compromise and provided assistance by public owners on supervision and verification of projects, it was still difficult to control quality since its site engineers were overloaded with too many works (PO23). With the unqualified workmanship, non-compliance to the guidelines and drawings at site resulted in the poor quality of works (PO7 and PO19).

With the effect on quality and result of reworks, the project had left behind actual work schedule and plan. The deviation in quality had led to deviation of time and becomes the issue of more arguments between the parties (PO7, PO14 and PO18). As a result the public owners had experienced 27.1% in frustrated situation because it had observed structural deviations in concrete beam alignment which was unacceptable to department (PO23). There was several reason of this issue. The contractor laborers had used irregular formworks for concrete works. They did not

produce. In addition, contractor casted formwork improperly and did not carry out proper curing of concrete works etc. Such carelessness of the laborers, improper verification and instructions to check and control construction process had frustrated the situation (PO7 and PO23). At such event, contractors had reacted by blaming the mistakes due to client engineer's inadequate supervision and irregular inspection at site despite of their request (PO7). Contractors have frustrated more when it had not paid the bills and issued the warning letters transferring the full risk of structural safety and its liabilities (PO7 and PO23). This led to 8.3% disputes because of the above reasons. So, the project had been suspended and stopped from continuing the works, because it had already failed in quality of works. Thus it gives direct benefit of understanding the conflict situation that has experienced during construction due to this issue at moderate level of conflict.

4. Level of conflict for “Poorly developed project planning and scheduling is conflict issue related to time”

Based on the experiences of owners in public projects, the conflict level was evaluated to be 2.975. This conflict falls in moderate level in a situation of antagonism faced during construction phase. This conflict level was calculated from distribution of each conflict level. It is based on their percentage of conflict that was experienced by public owners during construction. The conflicts evaluated by public owners had begun at very low level with 14.6% incompatibility at level 1 as shown in figure 5.5. It is the responsibility of contractor to keep in track with plans and schedule and revised changes in plan but public owners argued that contractors are non-cooperative during construction and even had been dragged to dispute because of this issue (PO3, PO12, PO14 and PO22). Of course public owner was able to manage and conflicts have not escalated further in one of the project (PO22). In such case, conflicts were experienced at very low level of incompatibility with contractor at beginning of the project. On the other hand, most of the public owners have experienced early conflicts with the poor project plan and scheduling. The reasons for such occurrences of conflicts are lack of adequate time to prepare proper plan and schedule for the project (PO2, PO20 and PO22). Moreover, it is due to lots of

pressures to start the projects before it could prepare good planning and scheduling process. Besides lack of good design and budget processes for the project could influence on the development of project planning and scheduling (PO8 and PO9).

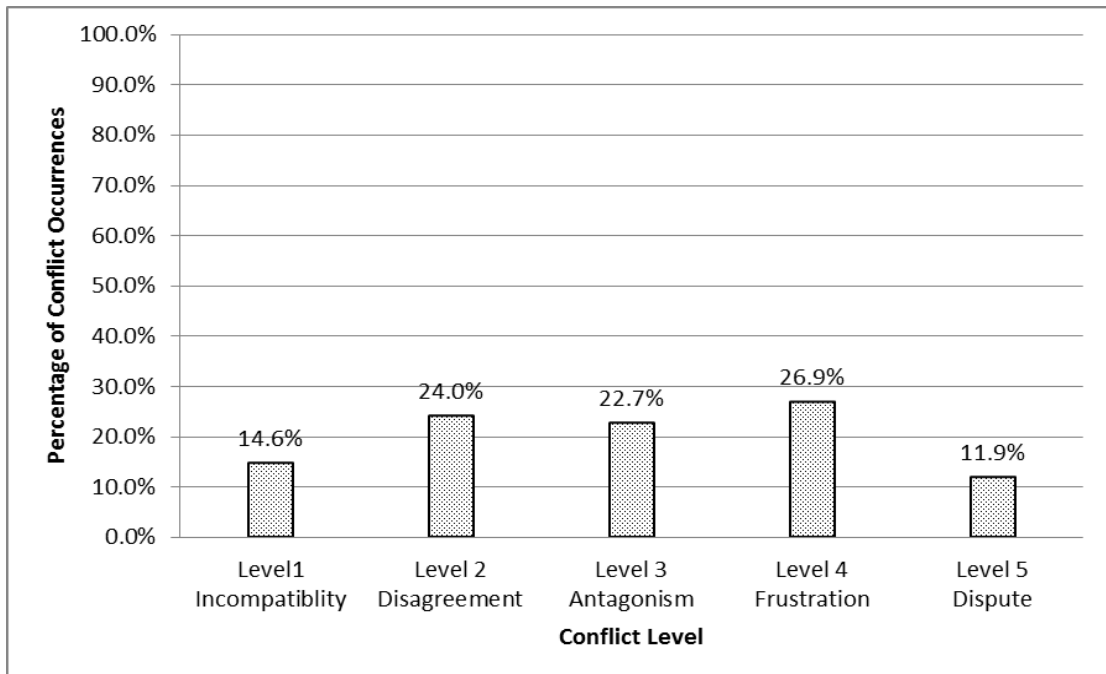


Figure 5.5: Conflict distribution in “Poorly developed project planning and scheduling”

Importantly, public owners expressed that the good project plan and schedule were never followed accordingly with the actual activities during construction due to various reasons such as drawings mistakes, inflations, labor problems, lack of competent project managers, incapable contractors, poor communication, management problems, equipment failures etc. (PO2, PO9, PO20 and PO22). As a result the public owners had disagreement with contractor when actual activities were lacking behind schedule and started to deviate from plan (PO4 and PO18). The amount of conflict at level 2 has experienced 24% disagreement. The public owners had tried to prevent project delays by conducting meeting with contractor and asking them to perform as per the work plan and scheduling processes. Even then, the conflicts had escalated to level 3 when public owners experienced 22.7% antagonism. Because of unresolved issue, the public owners had faced the situation of bitterness

and hatred when it had occurred severe mishaps and deviations in works. The reasons were mainly due to the lack of coordination, communication and control tools shown by contractor. It had raised claims and rights over time during construction phase (PO1, PO6, PO18, PO19 and PO22). At such situation, one public owner (PO19) had compromised on the time but another public owner (PO13) had not entertained any claims as a result of contractor's failure to work according to plan. Therefore the unresolved issue had escalated to level 4 with 26.9% frustration. The public owners were frustrated because it had delayed the project and on top of that the contractor had become non-responsive and had abandoned the project site according to public owner PO10 and PO14. The highest conflict experienced by public owners due to this issue was at high level of frustration situation. Although in some projects the project plans were modified to suit the site conditions and project activities that are on-going (PO14). It had also jointly agreed by conducting frequent meeting and revisited the work plan and accordingly revisions were made by public owners (PO16 and PO20). Yet it had not able to resolve the conflicts fully and escalated further due to poorly developed project planning and scheduling on time.

In addition, the reasons from owner's experiences were due to incompetence or lack of capable person from contractors to refine planning and scheduling to expedite the project activities during course of construction time (PO14, PO16, PO17 and PO24). As a result the contractor had failed to procure materials on time and did not manage laborers at site. Consequently the project had delayed beyond 50% of project duration. Even when the public owner started imposing penalty at maximum limit of liquidity stage of 10%, the contractors did not respond and few contractors abandoned the site (PO3 and PO24). Finally, the public owner had terminated the contract when it had delayed the project uncontrollably. That's why the public owners had evaluated 11.9% dispute at very high level of conflicts. Thus it gives direct benefits of understanding why the conflicts that occurred due to poor development of project planning and scheduling. Overall, it concludes that the conflict experienced by owners while undertaking public projects was at moderate level.

5. Level of Conflict for “Frequent change orders causes uncontrolled project schedule is conflict issue related to scope”

Based on the evaluation by the public owners the conflict level of this conflict issue is 2.960. The detail about conflict distribution in each level as experienced during construction phase is given in figure 5.6 below.

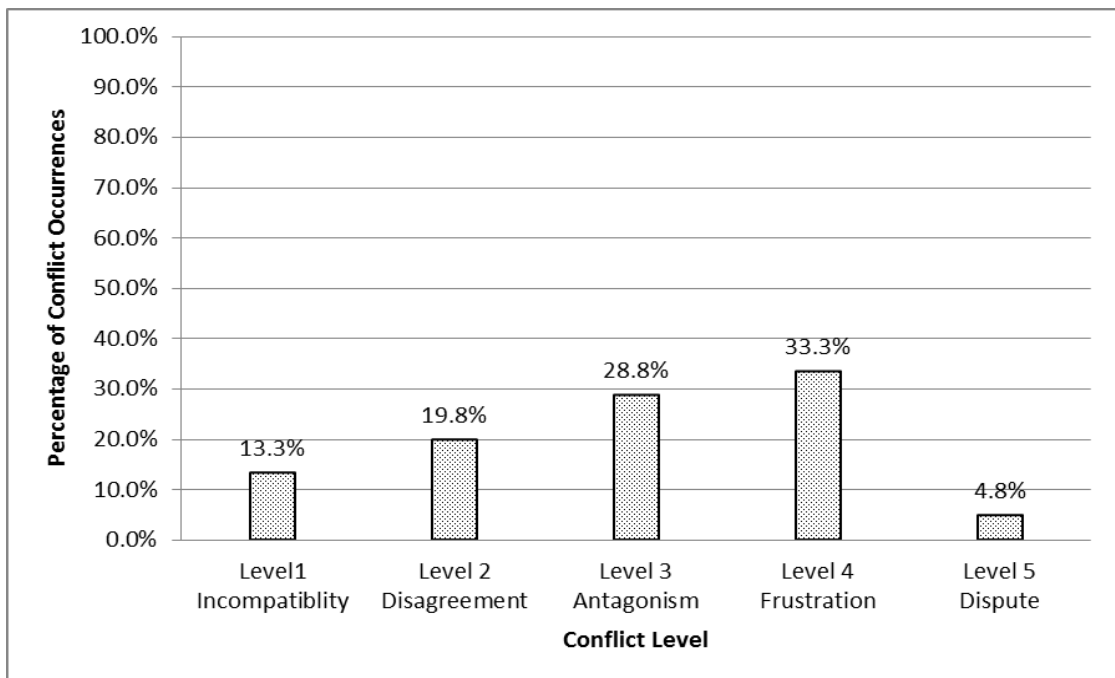


Figure 5.6: Conflict distribution in “Frequent change orders causes uncontrolled project schedule”

The public owner had evaluated 13.3% incompatibility over the frequent change orders that would cause uncontrollable project schedule during construction. The reasons expressed by public owners were the poor project planning and scheduling that influences during construction by department heads. It was also caused by interruptions and mistakes in design and poor workmanship etc. These factors would be the cause of schedule shift (PO3, PO5, PO11 and PO21). Apparently, it had led to 19.8% disagreement when there were changes being implemented regarding the position and building orientation. Actually the contractor had already completed the excavation and foundation work as per the original plan

and setting. So, the additional change had caused new earthworks and foundation layout where the scope changes were taken place (PO9). For current practice the public owner had not calculated the scope change, time and cost involved due to the change order. As a result the contractor and public owner had more disagreement at level 2.

Similar situation were experienced by public owner (PO15) during urban road construction which involved frequent changes in the alignment and curtailment of scope of works. The reasons were due to improper planning that has invited public interruptions due to land issue and property damages in the vicinity. With the frequent change in orders, there had no adequate compensation for time and extra resources engaged during execution of changed works. So, as a result the laborers and contractors were not happy with the works they were doing at site (PO9 and PO15). However, the public owner had provided the contractors with adequate information about the additional changes in time. But public owner were also not happy with the frequent change order received because it caused uncontrollable project schedule and changed the scope of works (PO1, PO6, PO11, PO22 and PO23). The conflict had occurred at level 3 after it had experienced 28.8% antagonism and hatred between the parties.

The frequent change orders had brought deviations in the scope of the work and the contractor had started claiming the extra cost and time hindrances. But the claims were not approved by the department committee arguing that the contractor had not followed the original plan and layout given in contract. Even the justifications forwarded by site engineers with evidences of the changes were not fully accepted by the public owner and committee (PO9, PO15 and PO22). As a result the public owner had evaluated 33.3% frustration at level 4. The frustrations between the parties had occurred more during construction when there were more deviations in quantities due to frequent change orders (PO9 and PO15). The project had also delayed and the hindrances had not given by the department committee. The work had not able to control with the proper schedule. As a result there had more confusion and mishaps with the activities when there had resource shortages occurred at site. At times the

contractor had not able to control the project and it was delayed beyond the normal schedule by 40% (PO9). Somehow, the owner had cooperated to accord scope variations and hindrances but the contractor was not satisfied against the actual claims and work done at site. Often the site had been abandoned by the contractor despite owners' assistance and cooperation. However the owner had suspended the project and stopped the payment until contractor resumed the work (PO9 and PO15). Thus the conflicts had occurred at very high level as evaluated by public owner with 4.8% dispute due to this issue. It gives benefit of understanding the situations that was experienced by public owners during construction phase.

6. Level of Conflicts for “Slow progress/performance by contractor is conflict issue related to time”

The public owners has evaluated this conflict issue for “slow progress or performance by contractor” and obtained conflict level of 2.946 in moderate level. The public owners had begun to experience 15.6% incompatibility situation during construction with this issue as shown in figure 5.7. This was the situations of mistrust and inconsistency with the contractor over the construction progress and successful completions on time. The reasons are that public owners knew that the contractor's performance won't meet the project completion date although it has been awarded the project. Moreover the contractors delayed the project usually by starting late and that made public owners to have incompatibility with the contractor at the beginning itself (PO2, PO19 and PO23). Although it was envisaged by public owners, it has not been able to do anything to resolve the very low level conflicts at the beginning despite its attempt to confront with contractors and avail the required assistance. As a result it had occurred 22.1% disagreement at level 2 with the contractors. At this low level of conflict, public owners had faced the situation of disagreement and confusions over the construction methods implemented by the contractors at site (PO2, PO8 and PO20). Further it has escalated to level 3 when it had 24.8% antagonism in a hostile situation due to slow performance by the contractor. The owners had experienced such situation because of severe mishaps and deviations in work due to lack of communication, coordination and without proper project control tools made available

at site by the contractor (PO7 and PO10). PO20 and PO24 expressed that they have experienced incompatibility right from the beginning of the project and without resolving it had become a serious issue unexpectedly at the later stage.

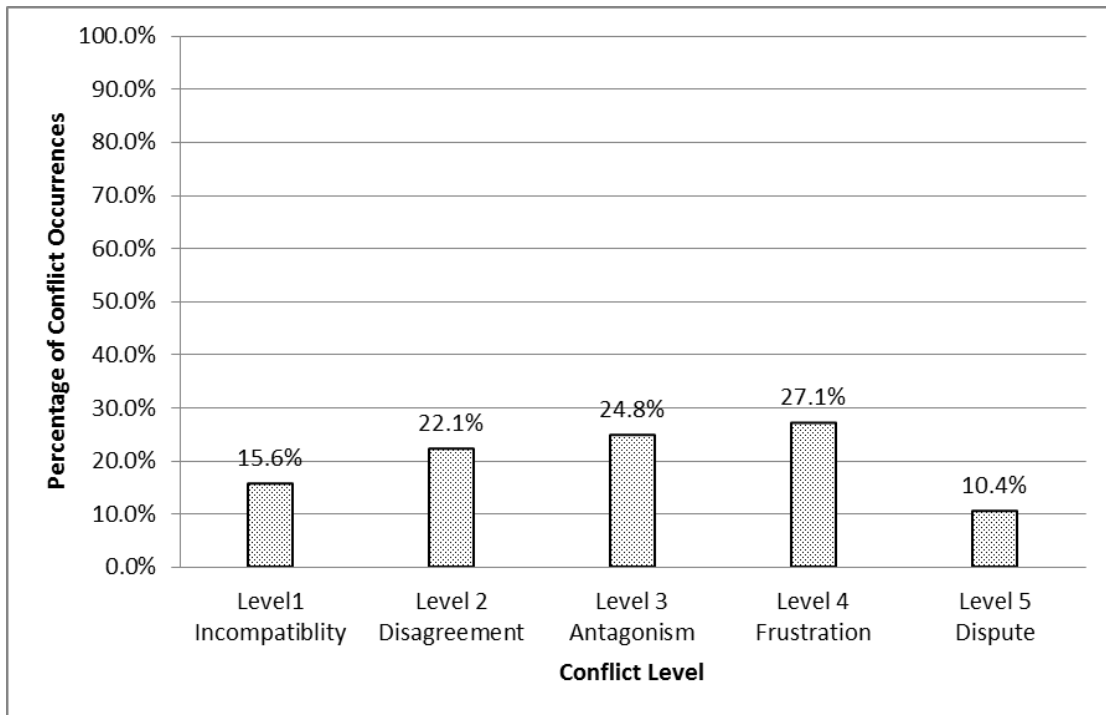


Figure 5.7: Conflict distribution “Slow progress/performance by contractors”

The reasons were that contractor had disagreed to provide with good resources planning and employment of skilled laborers, full time technical persons and engineers at site. However public owners had provided adequate assistance to contractors regarding advances and interim payments and supervision (PO3, PO14, PO8, PO22 etc.). Still then, the contractors had not performed with proper plan for the project and the public owners had kept reminding about the contract duration and delay that would occur. Even the public owners had tried to collaborate with contractor and emphasized on expatiating the works and engage with skilled workers and other required resources to avoid project delay. But contractors reciprocate with excuses and blame on other issues such as non-availability of enough resources in the market (PO3 and PO24).

On the other hand, some public owners (PO21 and PO31) expressed their confidence of the contractors that would carry out the project successfully on time and assured with their capacity. But in other projects it had experienced unexpected conflicts at mid of project and as a result it has escalated to higher level of conflicts (PO3 and PO12). As such the relationship between them has worsened since it showed improper management and coordination among the workforce and materials at site. Public owners added that it was mainly due to contractor's incapability to resource and manage project activities on time was the main reasons behind getting project delayed despite its support, repeated reminders and notifications (PO14 and PO23). Thus, without resolving such issue has further lead to rising claims and rights over time. This creates more frustrated situation of 27.8% at level 4. But the contractors contended on materials shortages from market supply and unavailability of skilled laborers. Even contractors reciprocated its reaction on other connecting issues such as design errors, rework, late received of bills and non-responsive by engineers etc. that delayed work progress (PO3, PO16, PO17 and PO22). Still the conflicts that have escalated from level 1 until level 4 has also not been able to manage and eventually reached to disputed situation.

The public owner had suspended the work as the contractor failed to continue and complete on time. Such actions from department had made contractor unhappy and reciprocated by engaging arbitrations in court (PO3, PO12 and PO14). Meanwhile, the owner had informed to construction board on such cases and accordingly contractors were revoked from future participation in public projects (PO12 and PO14). The public owner argued that this issue did not only fail to complete the project but also disrupt their relationships personally as well as with department office. As a result the public owners had evaluated 10.4% dispute at level 5. Thus it gives direct benefits of understanding why the conflicts that occurred during construction due to slow performance/progress by contractor. It concludes that the conflict so far experienced while undertaking public projects are at moderate level.

7. Level of conflict for “Time extension due to design changes is conflict issue related to time”

The overall level of conflict for this issue is 2.929 as evaluated by public owners in public projects. This issue falls under moderate level of conflict. The evaluation was obtained from their overall assessment on each level against the percentage of conflicts that has occurred during construction. Figure 5.8 shows the description about distribution of conflicts at various levels.

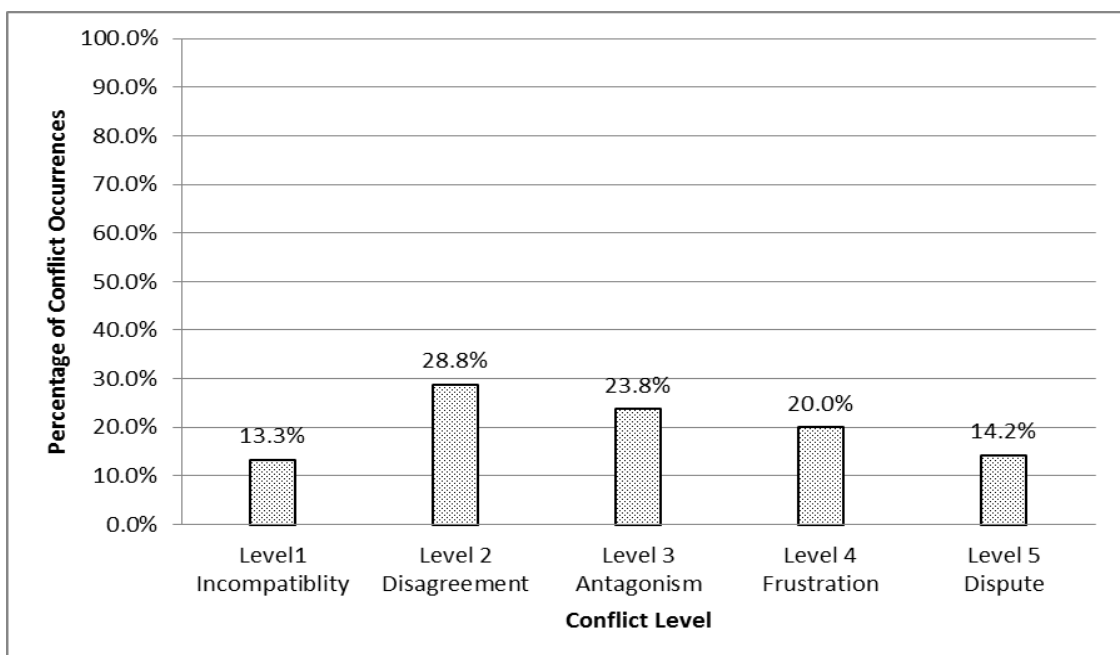


Figure 5.8: Conflict distribution for “Time extension due to design changes”

The design changes were inevitably experienced by public owners during construction time and it has begun with 13.3% incompatibility from very low level of conflicts. The time extension due to design changes were normally claimed because of the design errors which was designed by incompetent designer with improper design data and information (PO8 and PO23). In due course of time the engineer prepared the design without having much knowledge about the design data, site conditions and moreover numerous intervention from administrative heads and change of mind later during implementation led to the additional changes in design

(PO6, PO9 and PO10). In some of the projects, public owners (PO8, PO9 and PO23) have experienced 10 to 50% incompatibilities over time due to design changes and on the other hand at some projects, public owners (PO2, PO3, PO17 and PO18) have not faced any conflicts at the beginning. From public owner's experience, the conflict has not been managed while at low level due to long waiting time in redesigning and seeking approval from tender committee. The designs were not meeting actual field requirements and this affected subsequent activities (PO6, PO12 and PO13). Without having resolved low level of conflicts over incompatibilities had led to 28.8% disagreements between the parties at level 2. The disagreements between the parties were mainly on delay of activities due to design changes where usually contractors make point out of it. However the public owner had asked contractors to expedite the work by doing the alternate activities while waiting for drawing revision (PO20 and PO23).

However the contractors were benefitted the most when issues of design changes arise because it would acquire project time extension. But the time extension provisions simply due to design changes are not adequately specified in the contract that can oblige both parties argument (PO20, PO21 and PO24). Likewise, the conflict situation at level 3 had experienced 23.8% antagonism in more hostile situations and misunderstanding between the parties. The reasons were that granting time extension after committee's approval was not sufficient for the contractors because already built structures also changed with the new designed and involved additional works such as demolishing, rework, extra laborers and materials etc. (PO11 and PO24). In one of the school building project, issue had gone wild with contractors as the new terms were not acceptable since there was a lot of variations in quantities and cost for overtime and reworks (PO23). Of course, in some projects it has experienced 100% conflict at level 3 only as they had able to agreed mutually and compromised on time they availed and resolved the issue (PO11 and PO19). But unexpectedly, public owner had also led to antagonistic situation with contractor without any incompatibilities and disagreements when it started to have severe mishaps and deviations in work with the design change required (PO7).

As a result, this issue led to 20% conflict at level 4 with frustration. This situation was due to tension and unpleasant arguments over the schedule delays and more additional work. The contractors were compelled to speed up the works or otherwise they would have to bear the penalty for the delays (PO2, PO15 and PO22). Even at this level, the conflict in overall was not resolved. It reached to very high level of conflict with 14.2% dispute and were referred to court for settlement. The reasons that led to court was not only just because of this specific issue, public owners mentioned that it was also due to combination of other related issues such as compensation for cost, quality and the increased scope of works (PO2, PO13 and PO22). As a result of unsatisfied claims over time, cost and quality as triggered by this issue, the work had been suspended until further notice from the court (PO3, PO4, PO5, PO14, PO18 and PO24 etc.).

8. Level of conflict for “Late payment by client is conflict issue related to cost”

Late payment by client is the first ranked issue related to project cost with conflict level of 2.900. This conflict level is in moderate level of antagonistic situation in overall that has been evaluated by public owners. The detail of conflict distribution against each level is shown in figure 5.9. First it had begun with the incompatibility of 15.8% at low level of conflict because they were aware of the late payment that would occur during construction. The reasons for incompatibilities were budget lapses and shortages, late release of fund from concerned agencies, bureaucratic processes and inefficient payment procedures practiced by clients (PO19 and PO20). At this stage public owner had compromised with contractor on payment issue and cooperated to pay when fund is available. Public owner sometimes makes payment from the budget of some other projects (PO1, PO19 and PO25). But these underlying issues had occurred at level 2 with 23.5% disagreements when contractor claimed mobilization and secured advance payment. The disagreement over late payment had occurred when the secured advance bill submitted by contractor over claimed the actual cost of materials brought at site (PO7, PO8 and PO20). However the public owner had tried to make payment on time and processed through finance and accounting team to review and make prompt payment but this has not happened (PO8 and PO20). Besides

this the owner had also tried to re-appropriate the fund from different budget heads but the tender committee had not approved the proposal (PO15, PO20 and PO23). Especially, the donor aided projects were immensely delayed for payment due to late release of fund on time (PO10 and PO24). As a result the conflicts between the parties had occurred with 25.4% antagonism at level 3.

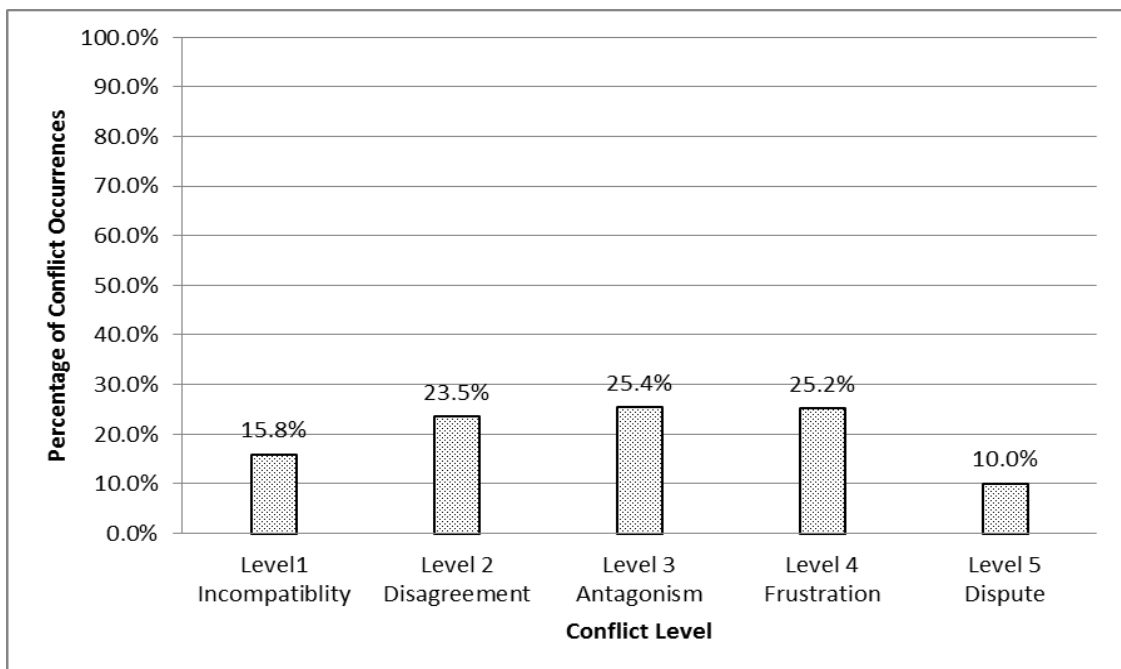


Figure 5.9: Conflict distribution in “Late payment by client”

The reasons were inadequate allocation of fund from financing source and delay in bill measurement and verification for interim payment. The frustration occurred when the contractor submitted false and incomplete bill. This has led to re-measurement of the works along with the contractor (PO20). In addition, owner has taken more time in evaluation and entering each and every items and quantities in measurement book before make payment which were tedious process and time consuming. Likewise the contractor also had frustrated when payment process was delayed (PO5, PO18 and PO22). At level 4, the conflict had occurred more with 25.2% frustration. The contractors had accused that client engineers were irresponsible and neglected their payment process despite of its constant follow-ups. Some contractors blamed that engineers are assertive and tainted over certain amount

for engaging in the project. Such situations had experienced as there are no specific contract clauses that defined the payment period as just says that payment can be done after receiving verified bill by the account section in a month (PO23). The public owner argued that normally one month or more time was required for measurement and preparing bill including verification and entering into MB (measurement book). Similarly public owner expressed that accountant also required more than 20 days to verify and pass the payment from account section on time. Such contradicting issues and accusation created misunderstanding between the parties and as a result it led to dispute (PO2, PO3 and PO23). The dispute experienced is 10% at level 5. At some building and infrastructure projects (PO2, PO3 and PO23), the public owners and committee had not satisfied with contractor's final quality of works. So the owner had not accepted the project and accordingly had issued warning notification to contractor for rectification. The final bill payment had also stopped unless contractor makes with required quality of works accordingly with the standard specifications. The contractor had agreed (PO13) but on the other hand, such action by owner enraged the contractor as they did not receive even the interim payment (PO3 and PO23). Finally the issue had put up to the court case by contractor following repeated rejection of the final project by public owner and nonpayment of bill.

9. Level of Conflict for “An unforeseen underground condition is conflict issue related to scope”

The level of conflict for this issue is 2.896 evaluated by public owners as experienced during construction of public projects. Overall this issue is in moderate level of conflict in an antagonism situation. The conflict distribution at each level as evaluated by public owners is given in figure.5.10. The conflict had started from very low level with 15.2% incompatibility as experienced by public owners. Because the public owner had worried about the site conditions on meeting of unforeseen underground conditions during construction that would probably increase scope of work and delay the project (PO2, PO3 and PO24). The reasons for conflict due to unforeseen underground condition are due to improper project planning that has led to improper survey and design. The causes were also due to lack of feasibility study and

proper quantity measurement done by the experienced engineers and quantity surveyor. With the progress of work, there had occurred 21% disagreement between the parties due to unforeseen underground conditions encountered at parking construction project. This unforeseen underground condition of seepage and shallow water table has affected to settlement of pavement (PO8). As a result it had changed the material specification during execution. Somehow the contractor had agreed to perform according to change order but in the meantime, the contractor was also frustrated with the reworks (PO21). The contractor had to perform rework several times despite his financial capacity due to instructions from department officials. How much extra cost does owner pay for extra works, contractors argued that they were totally frustrated to perform the repeated works which it failed in quality due to seepages problems (PO21). The conflicts between the parties had increased when public owner had experienced 27.1% antagonism at level 3 and 32.3% frustration at level 4.

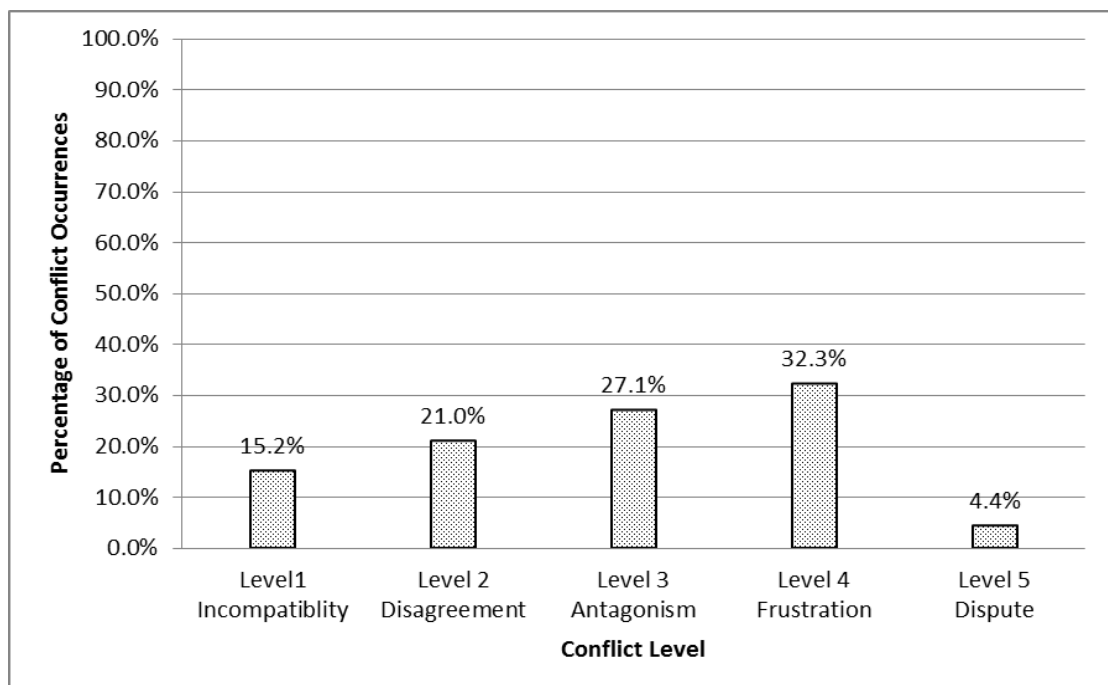


Figure 5.10: Conflict distribution on “An unforeseen underground condition”

Further, the contractors had faced cost and time overrun because of that particular contentious project and even they said it had hindered other projects also.

The public owner (PO21) expressed that somehow the contractor was helped in providing technical assistance at site to the never ending underground problems. Even the contractor had cooperated in continuing the reworks and executed according to the owner's direction. But the constructed parking area had developed cracks and potholes within few weeks of completion whereby contractor were asked to perform the rectification works again. This made the contractor furious when department head asked him to redo the work with additional underground longitudinal drainage system to drain the seepage flow (PO21). The contractor had failed to perform the work and delayed the project. As a result the public owner had suspended the project and had retained all the payments with the department. Thus the conflict has evaluated reaching the very high level with 4.4% dispute at level 5. It gives benefit of understanding the situation of conflicts that has experienced during construction with this issue.

10. Level of conflict for “Poor workmanship or rework due to non-compliance with methods and good practice is conflict issue related to quality”

The overall level of conflict for this conflict issue related to quality is 2.871 in moderate level as evaluated by public owner. From the figure 5.11, it shows that the conflicts at the beginning of the project were less and dramatically escalated in cumulative manner with the project progresses. The public owners had inconsistency over the workmanship of the laborers and lot of contradictions with the construction methods and practices performed by contractors. In addition, the current construction practices are still traditional and non-professional (PO12, PO17 and PO24). They were concerned and worried about the quality and final finishes of the structure (PO4 and PO22). In addition the construction had engaged with unskilled laborers and incompetent workforce. So, the conflicts had started with 16.3% incompatibility over the construction practices and workmanship. With the start of the project, the public owner had observed poor workmanship done by the unskilled workers and nothing done according to standard practices and professional. As a result, the labors had been instructed to redo the work but the rework has not been accepted by contractor (PO4, PO17 and PO24). With differences between parties, there had occurred 21.7%

disagreement at level 2. However, the root causes of rework were basically due to poor workmanship by unskilled laborers, insufficient and incompetent supervision, use of wrong materials, drawing errors, misinterpreted drawings and specifications, improper work sequence, improper work protection and safety issues, lack of coordination and meetings, poor communication between field inspectors and constructors, lack of quality control commitment and lack of good construction methods or standards (PO3, PO8, PO23).

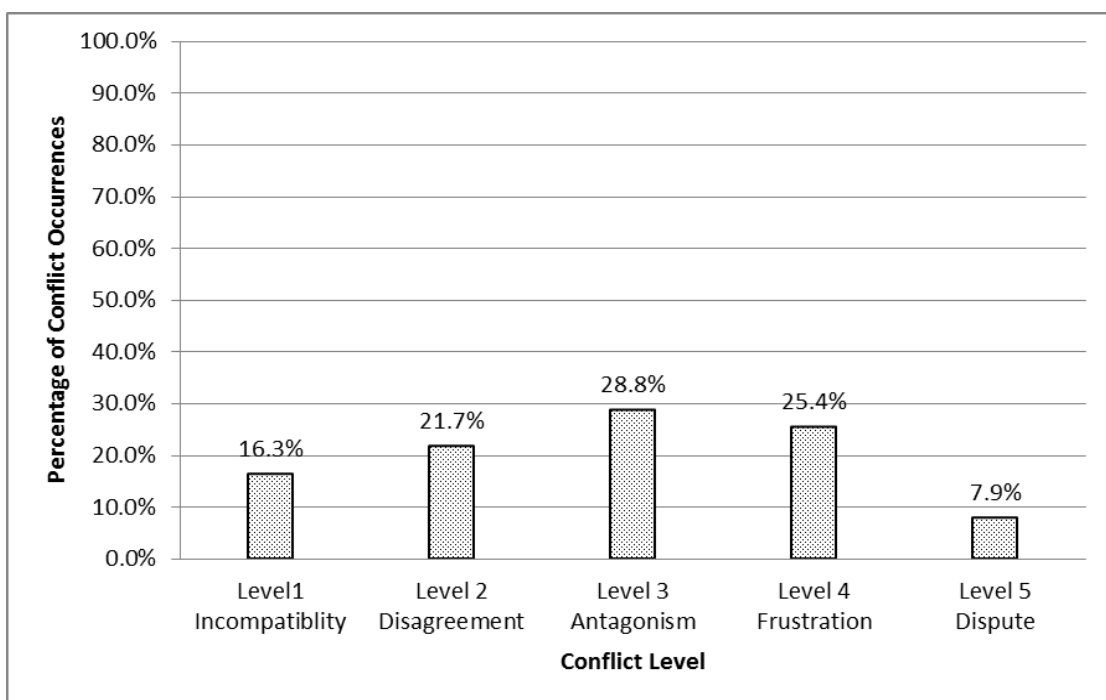


Figure 5.11: Conflict distribution on “Poor workmanship or rework due to non-compliance with methods and good practices”

With all these causes had further occurred at level 3 with 28.8% antagonisms. In some projects, it had tried to cooperate among the parties to perform the rework and built to meet required quality of works (PO7 and PO18). And also the qualities of work were poor because site engineers were not strict, not able to instruct laborers and allowed the workers to perform based on trial and error method (PO15 and PO22). Some site engineers exposed that they just supervised and rectify what they know best without any adequate knowledge on any modern construction methods (PO20 and PO22). However in the meantime the public owner had asked contractors to recruit

more numbers of skilled laborers and competent supervisors' especially vocational trained personnel at the project. As the project progresses, the owner found that the contractors had continued the work with old gang of laborers and not engaged the skilled laborers as agreed during the meetings. So the owner had rejected and demolished the work in which the quality of the work was not satisfactory (PO7 and PO20). The impact was the delay of project and contractor were unhappy with impose of penalties and running on reworks. At this stage, the conflict was quite higher with 25.4% frustrations at level 4.

The reasons are that there are no performance guidelines, professional corrective actions and quality control tools in time check and rectify the works (PO3 and PO23). It has been always the layman practices without any scientific and engineering practices introduced yet in the construction industry. The plants and machineries used also do not serve all purpose of construction work activities. They depended on imported second-hand and outdated equipment and moreover most of the equipment won't be available at site. Such delayed in making available of plants and equipment to site had brought about financial repercussion and troublesome holdups in the site and land up in doing layman jobs where the qualities of works were badly affected. Unfortunately, no Bhutanese contractors have the capacity in preparing and maintaining the quality control programs. All these factors had contributed to poor workmanship and affect the quality of work (CAB secretary, PO18 and PO21). When quality of work has been unsatisfactory, the contractors were stopped from progressive payment of bills and had imposed penalties for the project delayed (PO2, PO18 and PO22). In some project, the contractors had become irresponsive and neglected the site (PO15 and PO22). On the other side, contractor had fired back by putting up the case instead of accepting the rework and complete the project as instead from committee (PO22). Such cases of disputed situation had occurred at 7.9% dispute.

11. Level of conflict for “Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality”

The conflict level for “Non-compliance with quality control/quality assurance system or processes” related to quality is 2.867 as evaluated by public owners. So this conflict issue is in moderate level as experienced by public owners during construction phase. In the normal construction practice in Bhutanese public projects, there have been no definite quality control and assurance systems or guidelines being followed in the projects. Project implementers were mostly complacent and accepted whatever the contractor had done at the site without even referring to drawings and specifications provided. This kind of lethargic practice of construction works has always leave room for conflicts because at the end everybody wanted to have good quality of work finishes and becomes risk-adverse (PO1, PO4 and PO10). As such the consequences are the conflicts and it has ignited with 14.2% incompatibility situation between the parties during construction as shown in figure 5.12.

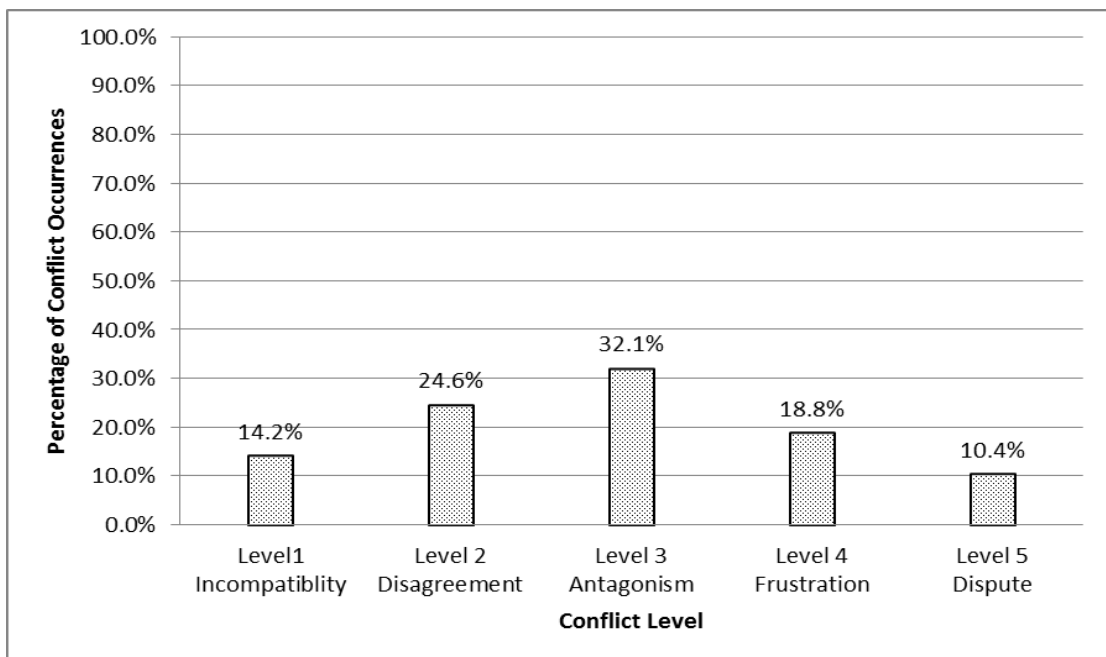


Figure 5.12: Conflict distribution in “Non-compliance with quality control/quality assurance system or processes”

The contractors were normally asked to prepare and submit QAP/QAS before the start of project but most of them were not aware of the quality control and assurance system and incompetent to prepare QAP/QAS (PO1 and PO4). So during that time, public owners had insisted by giving second chance and warning notification transferring the risk and liabilities (PO1). In other projects, public owner (PO4 and PO22) had imposed lump sum fines and forfeited the 10% performance security and increased defect liability period to 2 years. But some public owners were tolerant and irresponsible when contractors had failed to submit prepared QAP/QAS particularly for the project (PO2, PO3 and PO18). Somehow at some projects, the contractor's engineer has prepared and submitted QAP/QAS as per the contract but it has never been practical at site (PO22 and PO24). But most often public owners reminded only when quality of the work are not up to the expectations. At that time, both parties tried to compromise and agree each other on whatever they agreed to do and make work quality better but it was not the case in all projects as expressed their experiences by different participants (PO7, PO8 and PO20). In due course of time, the conflicts had jumped over to level 2 when they started to have disagreements between the parties. The 24.6% disagreement between them had experienced when the actual works performed were not according to standards and not following the professional job as they don't have the QAP/QAS to comply with quality control program and assurance system (PO23).

When the finished work carried out by the laborers were not acceptable, the issue from disagreement has gone to more unfriendly situation between the parties (PO7, PO8 and PO22). It has never been easy to resolve the conflicts as mentioned by some of public owners. For example construction of walls, window frames, cornices (architectural features), wood sliding, cutting-bending of reinforcement bars, RCC concreting works are being done without following guidelines and standards to achieve good quality finishes (PO22). Moreover, there were no documentation, field testing and inspection done with field quality program or quality systems. Unfortunately none of the construction companies had ISO certification and recognition to comply with quality plans and requirements of ISO 9001:2000 etc. (PO1, PO8 and PO23). Thus, the unresolved conflicts had increased to level 3 when it

had experienced 32.1% antagonism between parties. On the other side, contractors had argued that public owners randomly visited the site for demolishing and pressurizing the laborers for change of materials and caused rework (PO15 and PO20). Such situation had frustrated both parties when contractor's work was not accepted for poor quality and when project had tended to delay and incurred extra cost (PO14). As a result, the conflicts have reached level 4 when it had experienced 18.8% frustration among the parties. Further it has led to disputed situation with 10.4% occurrences when it has not able to manage from both parties (PO18 and PO23). The public owners expressed that the reasons for dispute with the quality issue was not only just because of this issue of non-compliance with quality control and assurance system. The problem had also contributed from different issues such as time, cost, safety, scope and personalities of the people involved during construction time (PO18 and PO22). The work had been suspended since it had failed to meet quality of the work on time and moreover the public owner had not accepted any deviations and extra cost claimed by contractors (PO18). It had gone so inexcusable to confront on the situation after all the project had been completely failed to continue and irrational on any payment of bills. However the overall level of conflict for this issue has evaluated in moderate level by public owners.

12. Level of conflict for “Ambiguous instructions and unqualified/ unskilled operators or worker is conflict issue related to quality”

The detail about conflict distribution on each levels based on public owner's evaluation are given in figure 5.13 below. In overall view, the conflicts experienced during construction phase are found in the moderate level of antagonism with conflict level 2.854. The conflict related to project quality due to ambiguous instructions and unqualified/unskilled operators or workers had been started to have incompatibilities when it have seen ambiguities in contract, specifications, drawings and participation of unskilled operators and workers to the construction project. So the incompatibilities evaluated by public owners are 17.9% at level 1. In addition, the disagreement had also started when there was no clear distinction between mobilization period and actual start date and that has resulted into divergent thoughts of work completion date

(PO4, PO10, PO19 and PO22). Somehow with the start of the project, the site engineer has still not able to convinced it and clarify on the actual start date with the site possession and mobilization period that contractors wanted. Such ambiguous instructions and involvement of unskilled operators and workers had evaluated the conflict at level 2 with 17.7% disagreement between the parties.

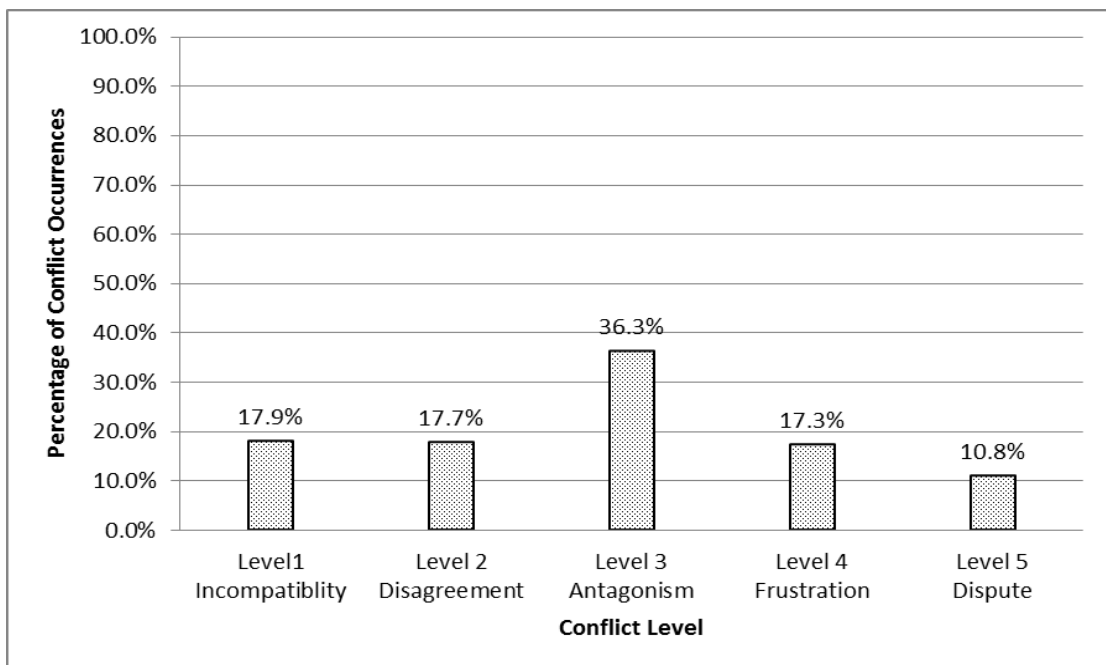


Figure 5.13: Conflict distribution on “Ambiguous instructions and unqualified/unskilled operators or worker”

The root causes of having ambiguous instructions at site and involvement of unskilled workers are due to lack adequate knowledge on construction practice, local workers lacking skills and commitment (PO11, PO13 and PO17). In addition, there are no timely training and update knowledge to engineers and workers. As a result most of them were unable to interpret design drawings and specifications, lack of awareness on modern technologies and construction methods (PO8, PO9 and PO23). Some engineers were lack experiences in similar projects, poor communication skills, cheap laborers recruited from India, interference on instructions and decisions by department, division and section heads as some are less qualified, unskilled, non-technical and lack adequate knowledge on engineering and construction (PO8 and

PO23). Because of such reasons, the instructions from site engineers and supervisors were unclear. Thus the unskilled operators and workers had carried out the work based on their own experiences, judgment and forcedly done at site. It might be right or wrong but when the quality of works was not acceptable to the public owners, it was instructed to demolish and reconstruct as they have deviated from the drawings and specifications. But the contractors had not easily accepted to the instruction for rework (PO2, PO8, PO11, PO17 and PO20). So when the performance and workmanship of the workers are very poor and unwilling to do rework, the situation had gone more hostile with 36.3% antagonism between parties in at level 3. At this level, more misunderstanding and hatred among workers, supervisors and site engineers had occurred due to severe lapse and deviations in work due to poor communication and unclear instructions (PO11 and PO17). Despite having coordination meetings at site, it had been not easy to resolve the issues because it had occur more deviations in the scope of work that required extra costs and time (PO19 and PO23). Some projects have not experienced such serious case and they had compromise on the works. But it has gone beyond the control in some projects according to public owners experiences.

For instance the contractor's labors and welders had welded and built the tubular trusses with wrong sizes of 110mm diameter instead of 90mm for school building roof and that had increased with additional weight of 2000kgs. The site engineer had the difficult situation, of course his job was to instruct contractor to remove it immediately, but the contractors had compromised on the quality of work (PO23). Such situation has broiled to more frustrations between the parties. That's why it has evaluated to have frustration of 17.3% at level 4. The heated arguments and claims had started between the parties. It had also been interfered by engineer head on behalf of site engineer but the department heads had also came in middle but they were just conscious of the time and complete the structure fast because the budget can be lapsed (PO16 and PO19). Engineers are one sided because of the risk and substandard quality of the structure built and other liabilities, but the contractors blamed on the engineer's unclear instructions and improperly interpreted to workers (PO19, PO20 and PO23). But the workers and operators were already engaged by

unskilled and unqualified one, especially the welders lacked expertise on welding. The issue was not only on the quality; it was also on the resultant safety and structural stability besides the time and cost overrun (PO19 and PO23). The case was difficult to resolve; somehow the contractor had cover the roof but the public owner did not accept the project and rejected the bills (PO23). Such experiences by public owner had occurred at very high level with 9.4% dispute. The public owner had written letter stating that the project can't be accepted and payment of bill shall be withheld unless the contractor removes/changes the roof truss according to the drawings and specifications. This has made the contractor to put up the case to court for final judgment. Thus it revealed that the ambiguity in construction projects leave lots of area of possible high level conflicts due to work quality issue and consequent causes of cost and time overrun.

13. Level of Conflict for “Non-compliance with occupational health and safety regulations is conflict issue related to safety”

The conflict level for non-compliance with occupational and health safety regulations related to project safety is 2.838 as evaluated by public owners. In overall view, the conflicts experienced during construction phase are in moderate level in a situation of antagonism between the parties. The detail distribution of conflicts at different levels as evaluated by public owners is shown in figure 5.14. First it has begun with 19.6% incompatibilities over the safety and its affect to project during construction. This was due to lack of adequate knowledge on labor act, less enforcement on safety rules and regulations by the employee which had created conflict between the parties. In addition the occupational and health safety regulations were not incorporated and provided in tender package with legal binding. The contractors had contended that the safety items are costly because such provisions are not included in the BOQ (PO4, PO8 and PO23). In the event, when the working environment had found to be risky and hazardous, contractors had asked to follow safety norms and regulations at site and assured them to have safe workplace conditions (PO5, PO9 and PO15). The importance of safety had paid less until an accident occurred at site although both parties had inconsistencies over the safety

issues (PO20). When it had occurred with fatal conditions at project sites, there were disagreements between the parties for not following the OHS regulations by contractor (PO24). Public owner evaluated the disagreement between the parties to be 19.2%.

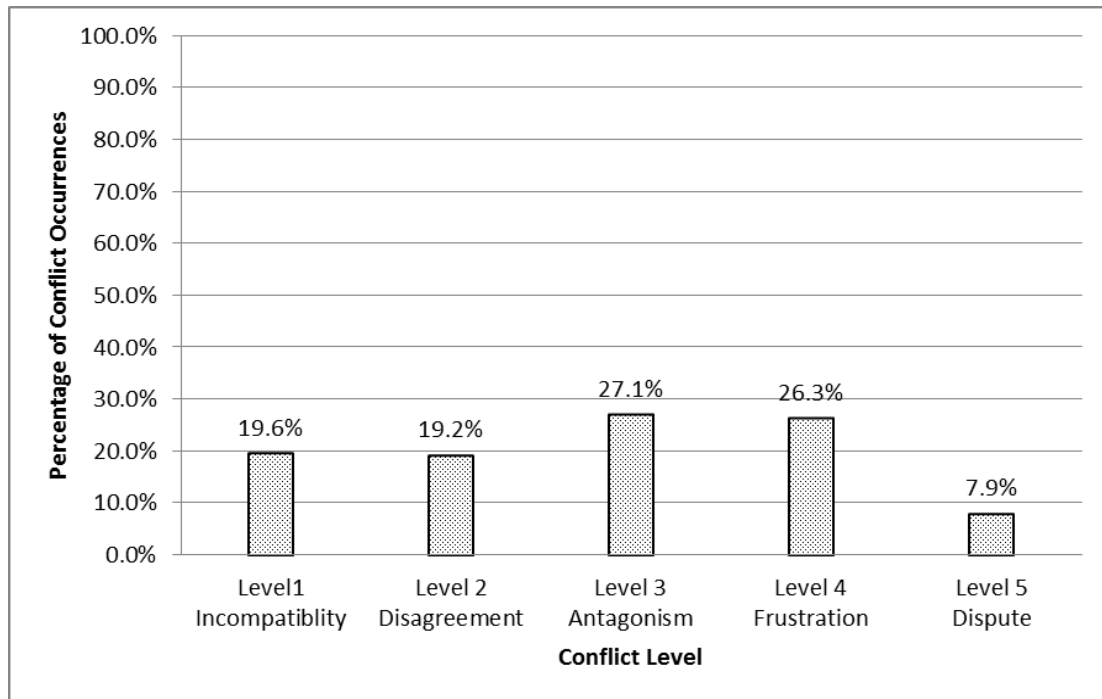


Figure 5.14: Conflict distribution on “Non-compliance with occupational health and safety regulations”

On the other hand, the contractors had argued on non-provision of such safety rules in the contract document (PO6, PO23 and PO24). Furthermore, the laborers were not willing to work with safety measures since they were not comfortable wearing safety tools and gadgets (PO23). At some projects parties had never aware of such practices and least bothered by contractor and compromised on the safety norms and regulations which had been like one had compromised on one’s life (PO23 and PO24). The reasons were that the contractors did not provide safety gauges and first aid medical services at work site and moreover public owners had not enforced the OHS regulations (PO17 and PO22). However at some projects, public owners had constantly followed up and reminded contractors to provide safety tools and mechanisms at site (PO18 and PO22). It has often found difficult to adapt to safe

working environment and especially the public owners had tough time to control and inspect all of the projects available when it has not shown any cooperation and commitment by contractors (PO20, PO21 and PO24). The contractor had just agreed at site to take care of any accidents, but when accident had occurred, it had the serious issue. It had created more confusion and scary site conditions. Because of such experiences, the public owners had evaluated 27.1% antagonisms at level 3. The contractors had willfully violated the rules and considered as the serious violations since it has not provided any safety tools and mechanism in place. The OHS regulating department officials had also inspected the site, warnings had been issued and penalty had been imposed accordingly. The contractors were not happy to receive warnings and accusation on serious violations against OHS rules and regulations (PO2, PO3 and PO22). The reasons are that some contractors were unfamiliar with the OHSR systems due to lack of training and education. As a result, contractors don't look for methods or process to protect workers at site. No modern tools and equipment were used which left the project site mostly vulnerable to fatal accidents. For instance, the still risky and unstable usage of bamboo scaffoldings and work benches, bamboo props and bent formworks for any concrete works provided more room for accidents at site (PO9, PO11, PO13, PO14 and PO22). The public owners said that despite of its repeated reminders it never cooperated by contractors unless serious physical harm or substantial probability of death occurred at site. Thus the public owners had experienced frustrations and evaluated 26.3% at level 4.

Likewise, when things were not in order, observed serious physical harm to laborers, delay of the project, some workers left the camp; the public owners with collaboration of Labor Ministry had verified the workplace conditions and checked severity of the casualties at site (PO13, PO19, PO20 and PO24). Accordingly, public owner had imposed fines and penalties for the failure and offense against repeated violations and moreover issued warning that if failure to abate prior violation will result in suspension of the project (PO12, PO14 and PO22). Of course it had not happened to every project that was surveyed but it has affected seriously to some projects due to such fatalities. That is why the frequencies of conflicts at respective levels are fluctuating but the severities were quite high with the increase of levels.

The reasons for such conditions are also due to lack of insurance policy and awareness on OHS, contractor's poor management, disorganized site, contractor's ignorance to practices and look for profits, engineers had also not given to take part in action role in emerging safety and health standards through participations in OHS meeting and training program (PO12, PO14, PO21 and PO24). With the rising number of accidents and carelessness at site, the public owners had imposed heavy fines because it had affected the continuity of work and the quality of work has not been satisfactory (PO18 and PO22). The project had also got delayed and most workers had left the construction site. The public owners had imposed penalty on failure to abate the prior violations on OHS regulation. In the event, contractors had not accepted the fines and had gone irresponsible and eventually faced difficult to resume the normal activities. There were no other alternatives for public owners than to suspend the works and forfeit all payments and security conditions after it had issued several notifications and reminder letters. The public owners had evaluated 7.9% dispute, the very high level of conflict. Thus it revealed the situation that has experienced by public owners with this issue during construction phase.

14. Level of Conflict for “Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope”

In overall view, the conflicts experienced between parties during construction phase are in the moderate level of antagonism as evaluated by public owner. Therefore the level of conflict for this issue is 2.817. The details about conflict distribution on each level based on owner's evaluation are given in figure 5.15. The owner had evaluated 14.8% incompatibilities in public projects with this issue. The change orders were initiated by department's request or order a change; site engineers initiated changes due to unforeseen site conditions or new governmental regulations. Contractor also initiated changes due to design errors found, field requirement, shift in schedule and mistake in construction etc. (PO2, PO3 and PO24). The root causes for change orders were also due to improper project planning and ill-defined scope of work, lack of coordination during planning phase, change of mind later on design and

construction methods, design errors, defective workmanship, force majeure etc. (PO6, PO8, PO9, PO11 and PO17).

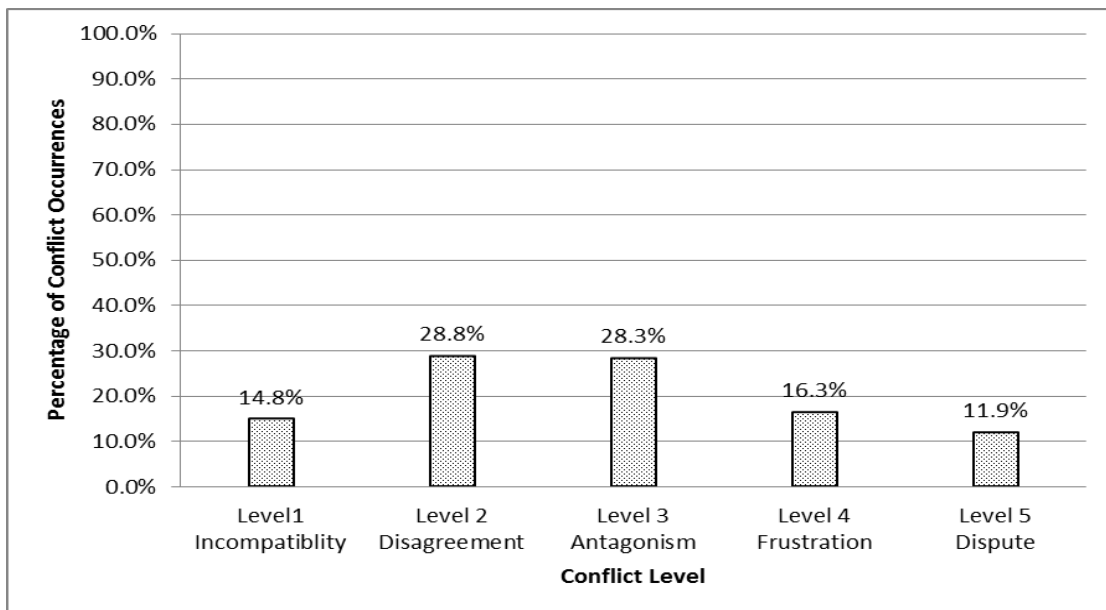


Figure 5.15: Conflict distribution in “Frequent change orders cause extra cost of work preparation or rework”

The disagreement between the parties had experienced when it has not able to actualize the work with the change order. Usually the disagreements occurred when the contractor was verbally instructed to incorporate the changes at site without proper drawings and specifications (PO8, PO11 and PO24). The laborers were confused with the construction methods and did not know which activities to carry out. Moreover the materials and equipment were not available to implement the changes (PO11 and PO24). All such situations had deviated from the original scope of work and the main issue was on differences in cost involved. The owner had evaluated 28.8% disagreement and 28.3% antagonism respectively at level 2 and level 3. The reasons were that the public owner had to frequently change the scope of work and found it difficult to analyze the rates for extra items involved (PO1, PO12 and PO20). With the change orders, it had found not easy to work on normal schedule, so their project schedule had been changed, extra laborers and expertise were needed to employ as the change of work cannot be done by available normal workers. It required extra

materials and equipment to incorporate that changes made to the work. Despite being smooth and cooperative, it had not been easy to accept change orders because the cost and time calculated was never realistic for contractor to cover up all the extra works that has been done following the change orders (PO20).

The frequent change orders had assembled the works. The rates for additional work could not be negotiated so this resulted into frustrated situations. The frequent change orders required the contractor to bring more materials and equipment to site (PO2 and PO15). Moreover the laborers were also frustrated as they could not complete the work that was initially instructed. The change order issued to contractors become uncontrollable when it has encountered unforeseen underground conditions and seepage problems. The contractor had to carry out additional works which were beyond his financial capacity due to instructions from public owners and department officials. The contractors argued that they were totally frustrated to perform the repeated works which failed in quality due to seepages and unforeseen underground conditions. Besides contractors had faced cost and time overrun because of that particular contentious project and even they said it had hindered other projects also. The frequent change orders also had experienced on the change of road alignment and site conditions (PO14 and PO22). The most difficult project the contractor and public owner encountered was on the urban road construction in local area plan (PO22). There were numerous change orders while constructing the road and amenities but the cost had reduced. However it had not compensated the time, amount work done and public criticism they faced against the cost they were paid (PO12 and PO24). Because of these experiences, public owner had evaluated to have 26.3% frustrations at level 4. Further it had evaluated to have 11.9% dispute between the parties at level 5 due to such unresolved issues. The contractor had gone insolvent due to frequent change orders and not able to perform it since the committee had refused to accept the work due to blaming on quality and workmanship. Finally the work had been suspended beyond the retention period and withholds the securities by public owner. Thus it gives benefit of understanding the situation of conflict due to this issue as experienced during construction phase.

15. Level of Conflict for “Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel”

The shortage or absence of competent technical, managerial or supervisory personnel at construction site is one of the main issues of conflict during construction. However, the level of conflict evaluated by public owner is 2.815 and the detail of conflict distribution on each level can be understood from figure 5.16 given below. It revealed that the level of conflict is found in the moderate level of antagonism.

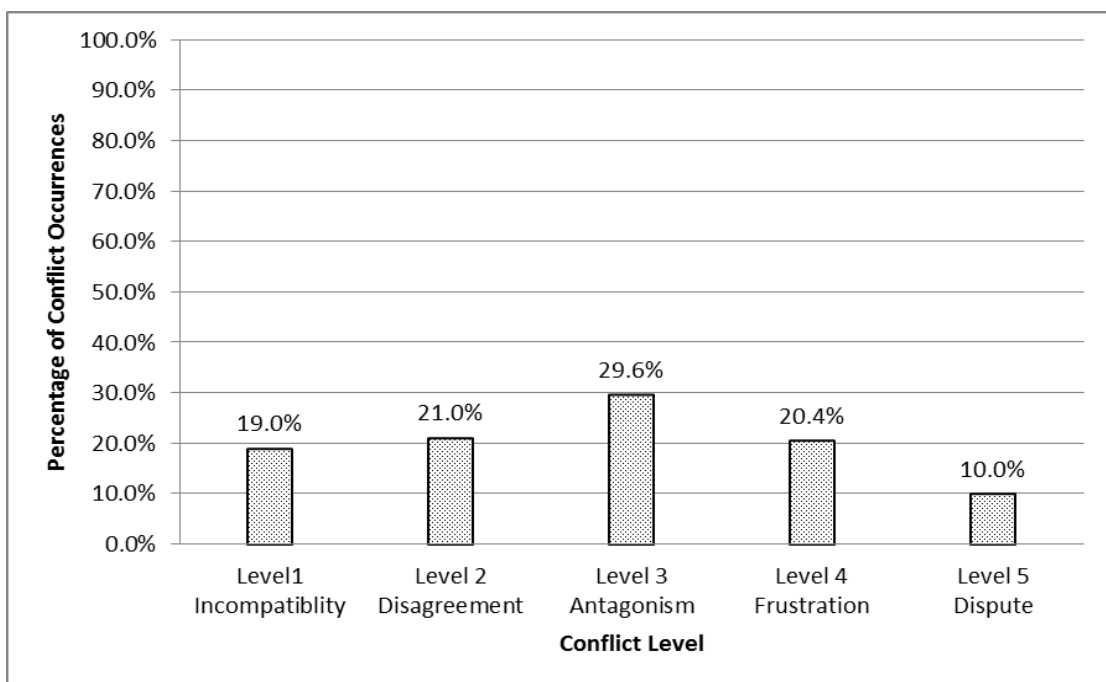


Figure 5.16: Conflict distribution on “Shortage or absence of competent technical, managerial or supervisory personnel at construction site”

It was obvious and evidenced from the survey that this issue can have conflicts during construction time; likewise it had started to have 19% incompatibility. The root causes for absence and shortages of competent technical, managerial or supervisory personnel at construction site are shortage of manpower in market, lack of training, more number of projects at a time, no encouragement and less payment, high demand of engineers, competent people resigned from the service after experiences,

and the construction industry itself is not fully fledged to have competent technical, managerial and supervisory personnel at projects (PO8, PO12 and PO22). With all these reasons, the public projects had suffered with time and cost overrun, poor quality and enormous variations in quantities and change in scope, accidents at site etc. due to lack of proper project controls and tracking by the competent personnel at site (PO4, PO5, PO9 and PO24). As a result the conflicts occurred at level 2 is 21% disagreements between the parties. The contractors did not deploy the site engineers and supervisors at construction site as agreed during tender and they just relied on public owners supervision and monitoring. Without having the regular site inspection by the engineers and supervisors from contractor's side at project site, the labor gang leader (labor contractor) controlled the overall site even though they are not qualified to interpret all of the drawings and specifications and contract documents. The ultimate outcomes from their performance at site are deviations and lots of faulty construction (PO5, PO9 and PO23). Such conditions had made to experienced conflicts at level 3 with 29.6% antagonism between the parties.

In some projects, non-technical person were involved in supervision and moreover it had run mostly by incompetent technical person. However, it had tried to compromise and provided assistance by public owners on monitoring the projects, the project had still cannot control since government engineers cannot be at site every day. It's the responsibility of contractor engineers to be present at all times and control the project, and they can appoint client engineer as when problems occurred at site but this is not the case happening in public projects (PO4, PO5, PO18 and PO23). As a result it had more frustration between the parties when it had failed the project. The conflict evaluated at level 4 is 20.4% frustration when contractor could not produce site engineers on full term in a project despite repeated reminders and notification from the public owner (PO18 and PO24). When deviations of works delayed the project, public owners had not paid for the extra items and time compensation on whatever matters contractor had raised the points. Because of the issue with non-availability of site engineers and supervisors at site had gone perplexed and more complicated when it had involved every context related to defective workmanship and inferior qualities and finishes, delayed already, non-continuity of

the works, sneaky attitude of contractors and nothing makes thing happen at site, accidents at site and so on (PO5, PO9 and PO24). Such circumstances at the project had infuriated the public owners and terminated the contract because the contractor not responded on call for negotiation and confronting the situation. So, it had experienced high level conflict with 10% dispute between the parties. This dispute of very high conflict had experienced not only just because of this issue, it had also resulted from other issues related from time, cost, quality and safety in project. Thus it gives benefits of understanding the situation of conflicts that has experienced by public owners while undertaking the public projects.

16. Level of Conflict for “Slow decision making by client is conflict issue related to time”

The overall conflict level evaluated by public owners is 2.790. Thus, this issue falls under moderate level of conflict in antagonism situation. The distribution of conflicts at various levels for this issue is given in figure5.17. The reasons are that effective and timely decision from client had been necessary for projects to be completed on time and to avoid delay when it had required many changes and disruptions during construction (PO1, PO8 and PO24). And, public owners had expressed that the department office and officers in-charge has not been satisfactory in providing timely decision to project and moreover it has been argued that the decision making process took very long in the bureaucratic system. Because of such processes, the conflict was evaluated to have 15% incompatibly over the construction process and raised concerns for project delays. The committee members and person involved for decision making process were mostly involved by non-technical and lack of adequate expertise on contract and procurement process. This has become the decision making process lengthy and need long waiting for decision to come from top level of officials. As a result of slow decision from client, it had occurred 32.1% disagreement when it had started to delay the works.

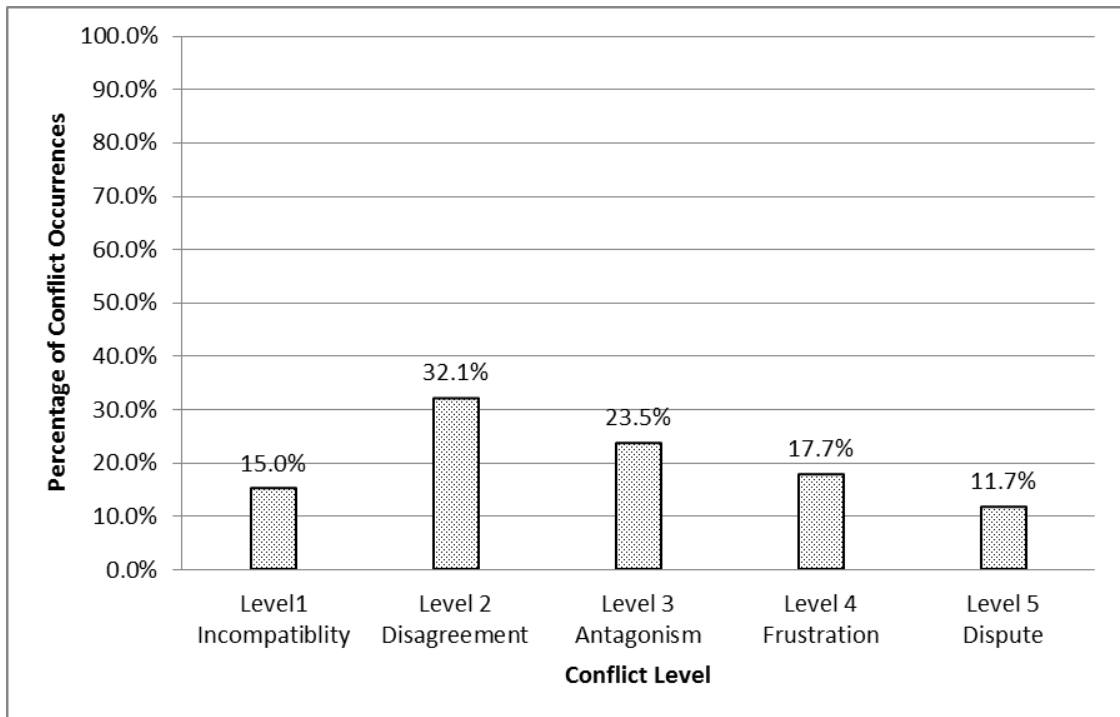


Figure 5.17: Conflict distribution on “Slow decision making by client”

The conflicts due to such issues of long waiting for decision from client had experienced 23.5% antagonism at level 3. The project had delayed as explained by public owner when it was not easy to run the normal activities as per schedule (PO19 and PO22). The public owners had expressed that the situation became forceful and was like one man show and taken risk in decision making by site engineer himself because of not receiving timely decision to change the window components drawings. At some infrastructure projects, public owners had not taken any risk and force the situation but waited for the tedious process of decision making (PO3, PO6 and PO17). In such situation it had controlled the project by compromising and negotiates on time by requesting contractor to priorities the activities (PO13 and PO23). On the other hand, the project had delayed already and contractors claimed for time compensation for delay because of late decision by public owner’s side (PO13, PO22 and PO24). But the public owner had not granted any time extension and had argued on project delay were due to slow work progress and performance by contractor (PO22). As a result it had computed conflicts at level 4 with the experience of 17.7% frustration.

The public owner said it had gone so controversial among the parties; however the slow decisions are resulted from top decision makers such as from department and ministerial tender committee. As such when the decision had kept pushing at the end of project duration, the frustrations had intensified with more deviations and delay occurred to the project (PO10, PO13 and PO23). The argument with contractor had become severe because the contractor had not carried out the works according to the project schedule. This slowed the work progress as the contractor could not carry out the remaining activities because the decision was yet to be made (PO23). For instance the client had failed to give concrete decision on hindrances claimed by contractor for project delays due to submerging of the wall foundations constructed during monsoon season (PO18 and PO23). Such non-cooperative situations had forced public owners to evaluate 11.7% dispute at very high level of conflict due to this issue of slow decision making by client.

17. Level of conflict for “Lack of detail drawing is conflict issue related to quality”

The level of conflict for this issue is 2.785 in moderate level of antagonism in overall as evaluated by public owners. At the beginning of the project, the conflict had started from very low level of 17.7% incompatibility. Because public owner had aware of drawings whether it was designed and drawn by competent architects and structural engineers (PO8, PO10 and PO23). The public owner had noticed the ambiguity, errors and missing in the drawing including some component details and structural requirements but they couldn't make a big issue since the construction process was just begun (PO4 and PO16). Somehow it had proceeded with construction activities and provided the missing drawings and revision had done accordingly but in some projects the revision time was taken more than anticipated. In addition, the drawings which were provided were old, outdated and prepared by inexperienced engineer (PO4, PO8, PO10 and PO23). With this reason and unresolved issue, the conflicts had increased to 27.3% disagreement as shown in figure 5.18.

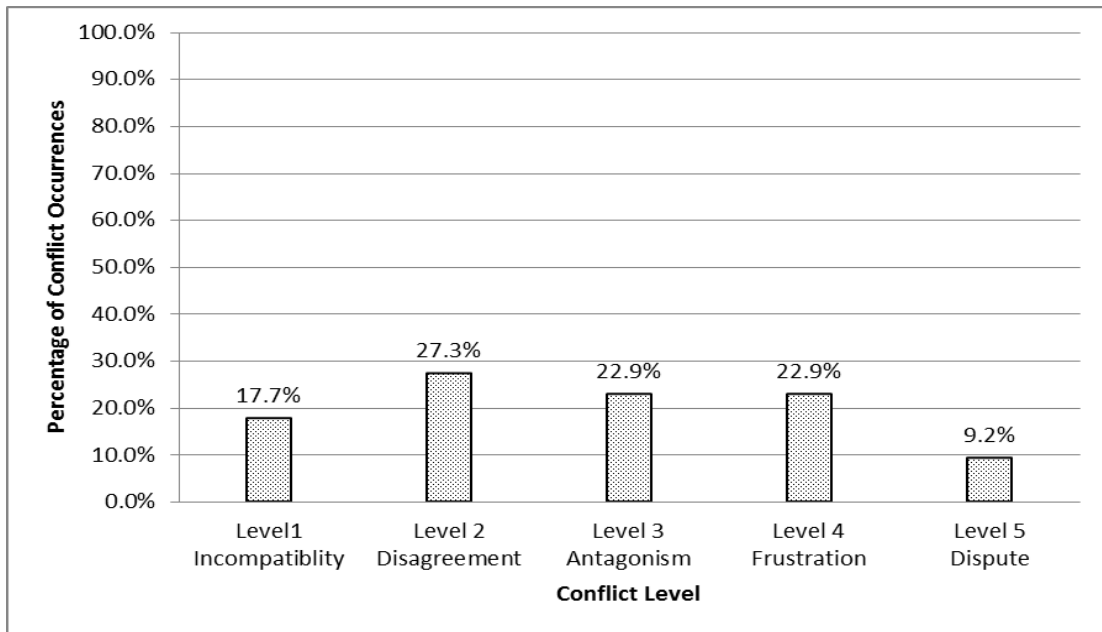


Figure 5.18: Conflict distribution on “Lack of detail drawing”

The root causes for such situations that had occurred are due to several factors such as inexperienced designer, insufficient time for detailed drawings, lack of understanding on the project components by designer, used old or outdated drawing which does not match with specifications and circulating same drawings for constructing same structures in different locations without proper planning, site investigation and detailed survey (PO6, PO11, PO20 and PO24). Combination of all these causes and incapable to manage on time had increased the conflicts from low to high level that has affected to project quality. The project quality of structure was affected when the workers frequently demolished and rebuilt according to the revised drawings (PO20 and PO24). Because of these circumstances, conflicts had further escalated to more hostile and hatred situations during construction process with 22.9% antagonism. Often, the site engineers were tended to take the requirement of detailed drawings for granted and had difficulties with work revision at later stage during construction (PO1, PO7, PO11, PO12 and PO17). The public owners had accepted their mistakes and provided the contractors with a complete set of detail drawings in time (PO6 and PO11).

On the other hand, some engineers just visited the site accompanied by their department heads, committee members and forcefully instructed to demolish and redo when the quality of the finished works were not acceptable (PO5, PO15, PO22 and PO23). Even the public owner's constant follow-ups, long waiting for revisions and rework had frustrated the contractors. This had led to deviations in the work and delayed the project. As a result the issues had gone more sensitive with claims and rights over time, cost and quality due to the main issue of lack of detail drawings. Project owners experienced around 22.9% frustrations at level 4. Furthermore public owners had experienced 9.2% dispute making at level 5. There were several reasons for this conflict apart from the lack of detailed drawings such as unskilled workforce, slow progress by contractors, incompetency of the engineers in delivering the right instructions and inadequate supervision by both parties etc. (PO18, PO20 and PO23).

With all those attributing issues together with the lack of detail drawing issue, the project was not acceptable to the public owners, department officials and technical committee members during final inspection. As a result the public owners had withheld the payments and other securities unless the contractors rectified the work (PO18, PO20 and PO24). Most contractors followed the instructions from the public owners but some argued that it was not fair. Few contractors initially started to settle this dispute through other means of arbitration but when there was no resolution, the matter was forwarded to court (PO18 and PO24).

18. Level of conflict for “Lack of clear information to address price escalation index is conflict issue related to cost”

The lack of clear information to address the price escalation index is the conflict issue related to project cost with an average of 2.763 in the moderate level as evaluated by public owners. This conflict level was obtained from the percentage of conflict occurrence distributed against each conflict level as shown in figure 5.19 below. First it begins with 15% incompatibility situation at level 1. The root cause for having the incompatibility situation during construction was due to lack of well-defined about prices escalation in bidding document, no detailed market survey and

unrealistic BOQ which has prepared based on archaic Bhutan Schedule of Rates (PO24). Both parties were helpless on this issue and they were certain that this problem would result in conflicts once the project progressed. The conflicts had occurred at level 2 due to occurrence of 30.6% disagreement between the parties as predicted.

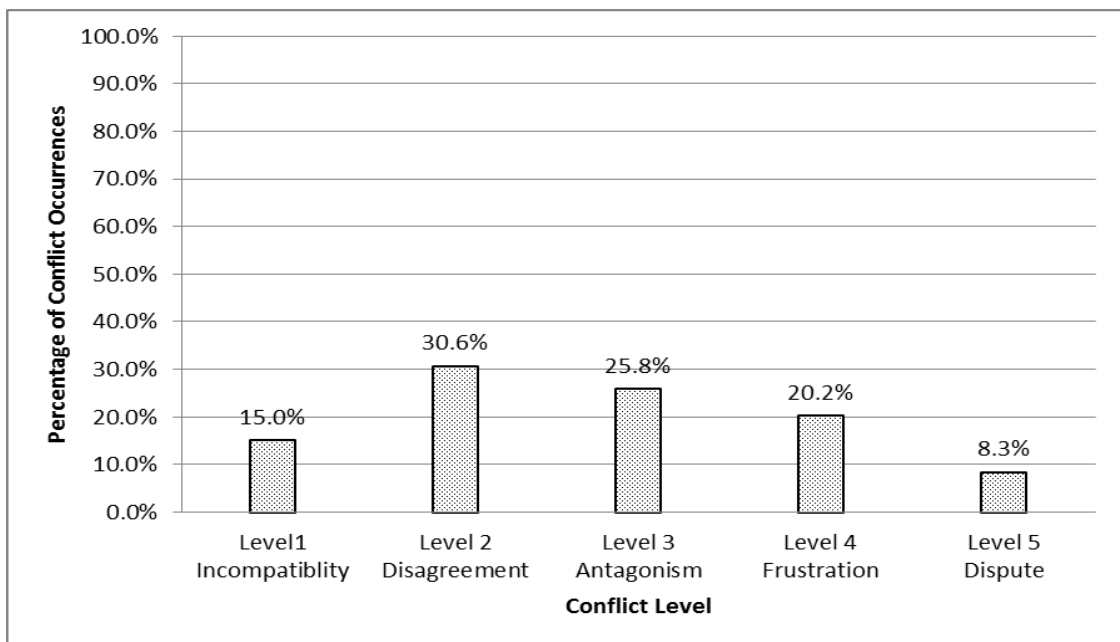


Figure 5.19: Conflict distribution on “Lack of clear information to address price escalation index”

The disagreement occurred when both parties failed to negotiate the rates of each item due to changes or price escalation in the existing market (PO24). The public owner expressed that both parties were not in a position to defend on the market price fluctuations that actually had influenced the construction material prices. The unprecedented price escalation for construction materials over the last 2 years in Bhutan has caused significant difficulties for most contractors and suppliers (PO10 and PO20). Moreover, the prices for every construction product have increased drastically over the last few years. As a result contractors had to face hardships to manage actual project cost with the fluctuating market prices.

In addition the contract document did not have a specific clause for the price escalation index. So far public owner had accepted the unit rate analysis based on the rates collected from suppliers and manufacturers which were practically not applicable (PO1, PO8 and PO20). As a result price escalation becomes unpredictable due to lack of proper formula or indices to calculate and incorporate during such inflation. So the projects had delayed and qualities were suffered, as a result the accusations and misunderstanding among the parties were aggravated to serious issues when it had not able to address on time and unsatisfied with construction progress (PO6, PO10, PO22 and PO23). Consequently the conflict has experienced 25.8% antagonism and 20.2% frustrations among the parties. The public owner had always emphasized and insisted contractors on time and quality with construction progress but the contractor was unable to cope as instructed due to hardships in getting materials. Beside the escalation of materials prices, dramatic increase of labor rates, the energy and transportation cost also had increased rapidly in Bhutan (PO10 and PO22). For instance there was 38% increase in fuel prices in recent times that have frustrated the general public besides construction practitioners. Another factor that caused price escalation of material costs was the huge demand in infrastructures (hydro projects, rural roads, municipal developments etc.) and housing projects (institutions, schools, health centers, public buildings, recreation facilities etc.) which are ongoing in the country (PO16, PO18, PO21 and PO23). The more frustrated situation was experienced when the owner rejected contractor's unit rate analysis for each items. The public owner mentioned that contractor's profit margin was never met and had run the project on loss, and even became bankrupt (PO5 and PO23). In fact, both parties faced difficulties in negotiating the unit rate analysis because the contractor submitted his analysis based on prevailing market unit rates at that moment whereas the public owners followed Bhutan Schedule of Rates (BSR) and material coefficients prescribed one or more years earlier (PO5, PO19 and PO23). Such futile situation had developed because the project duration was more than one year and the variations were extremely high. Nevertheless, the public owner had also attempted to negotiate in some projects by incorporating 7% escalation index based on assumptions and following the Indian Price Index method mentioned in the contract document (PO3 and PO5).

The main reasons are that, the construction industry does not have producer price index (PPI) for construction materials and components, no input price index (CPI) and seller price index(SPI) unlike other developed countries to measure every changes in the prices of construction process (CAB secretary). With those unresolved issues and lack of clear procedures, it had led to 8.3% dispute since it has not able to negotiate on the unit rates due to large variation in the price from the original contract amount.

19. Level of conflict for “Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope”

In overall view, the conflict experienced by public owner during construction phase is in moderate level of antagonism with conflict level 2.748. The detail about conflict distribution on each level based on their evaluation is presented in figure 5.20. The excessive variations of quantity such as requiring massive earth excavation were due to improper project planning that has led to improper survey and design. The causes were also due to lack of feasibility study and proper quantity measurement done by the experienced engineers and quantity surveyor (PO8, PO14 and PO22). In some cases, the survey was carried out briefly due to time constraints. In others, no prior site investigations were done. The preparation of the estimates was based on the drawings given by architects and designers (PO2, PO7, PO8, PO14 and PO24). Due to such inconsistencies in the detailed study and quantity estimation, it had led to low level of conflict at level 1 with 13.8% incompatibilities as shown in figure below.

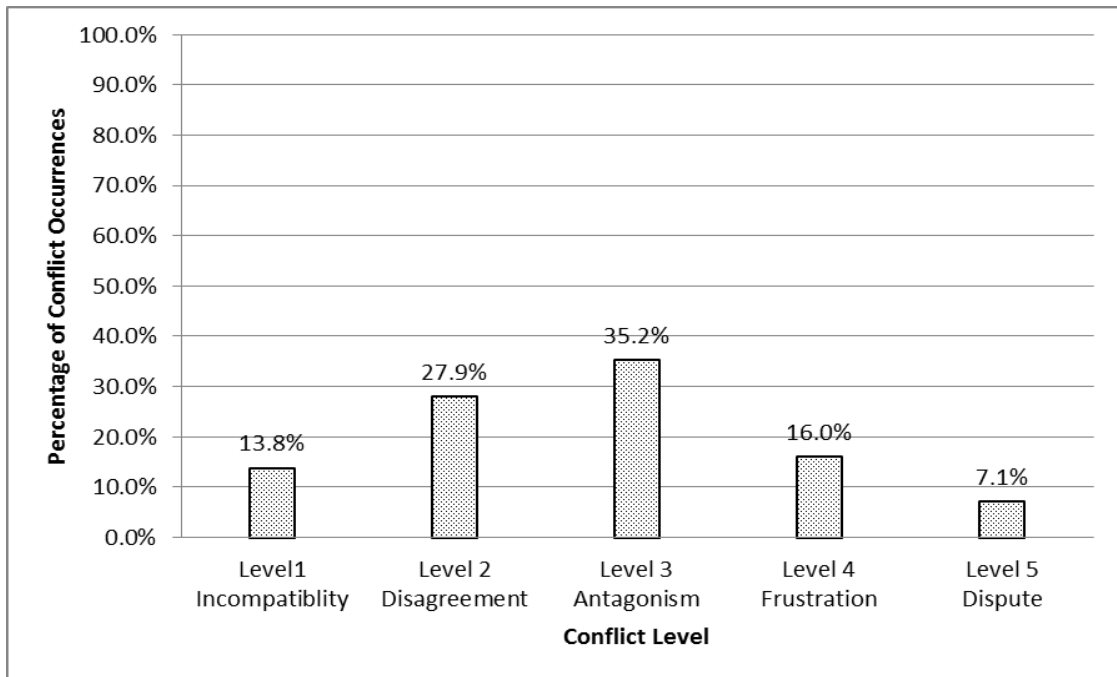


Figure 5.20: Conflict distribution on “Excessive variations of quantity such as requiring massive earth excavation”

Further, the 27.9% disagreement between the parties had faced when it observed variations in quantity due to massive excavation required at site (PO4, PO15 and PO23). The disagreement was mainly on change of scope works, time and cost involved. When excavation work had started, it had aggravated the conditions because additional soil had moved further downward covering the foundation works. In some other projects, it had difficulties in earthwork excavation due to presence of extensive hard rock that had required additional materials, tools and machines to detonate and clear the way. The additional items, quantities, materials, expertise, tools and machineries required for such encountered excavation works was apart from what it has agreed actually in contract. At some areas, the soils on upper mass had been very loose and marshy and haven't noticed earlier by anyone (PO4 and PO23). Because of these factors, this issue caused a high variation in quantity and payment. Both parties were not in a position to negotiate and hence they experienced hostile situation (PO1, PO7, PO20 and PO23). The conflicts had increased at level 3 with 35.2% antagonism as experienced between the parties.

In a few public projects, variations in quantity were justified and accordingly the public owner made payments to the contractor after seeking approval from technical committee. Even extra cost incurred and time extension had been granted by departments because the site engineers convinced the committee members with evidential supports attached from the site (PO2, PO17 and PO23). But in some cases the analyzed unit rates were not acceptable to the tender committee due to high variations in scope of work and this led to heated conversation between the parties. The department had denied the proposal as they did not have sufficient amount of money to be paid for such high variations and the government does not sanction additional amount for the particular work. Moreover the particular project being funded by Government of India (GoI) it was difficult to get the budget on time (PO5, PO18 and PO21). While the contractor's expenses was almost equal to the amount of contract price for excavation only including blasting, drilling, transportation etc. and half of the project time had already spent on it (PO18).

As a result, it had more tensions between the parties and it had occurred 16% frustration at level 4 with regard to project delay, fighting for claims and hindrances. Furthermore, the conflicts between the parties have escalated when they have experienced 7.1% dispute. The project site was abandoned and the contractor had become non-responsive since all labor gangs have disappeared already after their living allowances had not paid on time. The contractor had run on loss and his bills were suspended by the department (PO18). At the end, the contractor had put up the case to district court as it was not satisfied and gone unfair with the project. Yet the issue was still in the court. Thus it gives benefit of understanding the situation of conflicts that has experienced during construction phase because of this issue.

20. Level of Conflict for “Irresponsibility/ Lack of commitment/ attitude & personality problem is conflict issue related to personnel”

The public owner's evaluated level of conflict for this issue is 2.746 and the detail on conflict distribution on each level is presented in figure 5.21. From public owner's experiences, it revealed that the level of conflict is in moderate level. The

main grounds behind conflict for any issues related to project goals, objectives and project successes are the irresponsibility, lack of commitment, attitude and personality problem of the concerned persons involved in the construction project (PO4, PO6, PO17, PO20 and PO24). Right from start of the project, public owner had 21.5% incompatibilities over the whole construction process since individually worried about another person's reaction and responsibility of the project because it depends on each other's good relationship for successful completion of the project (PO6, PO17 and PO24).

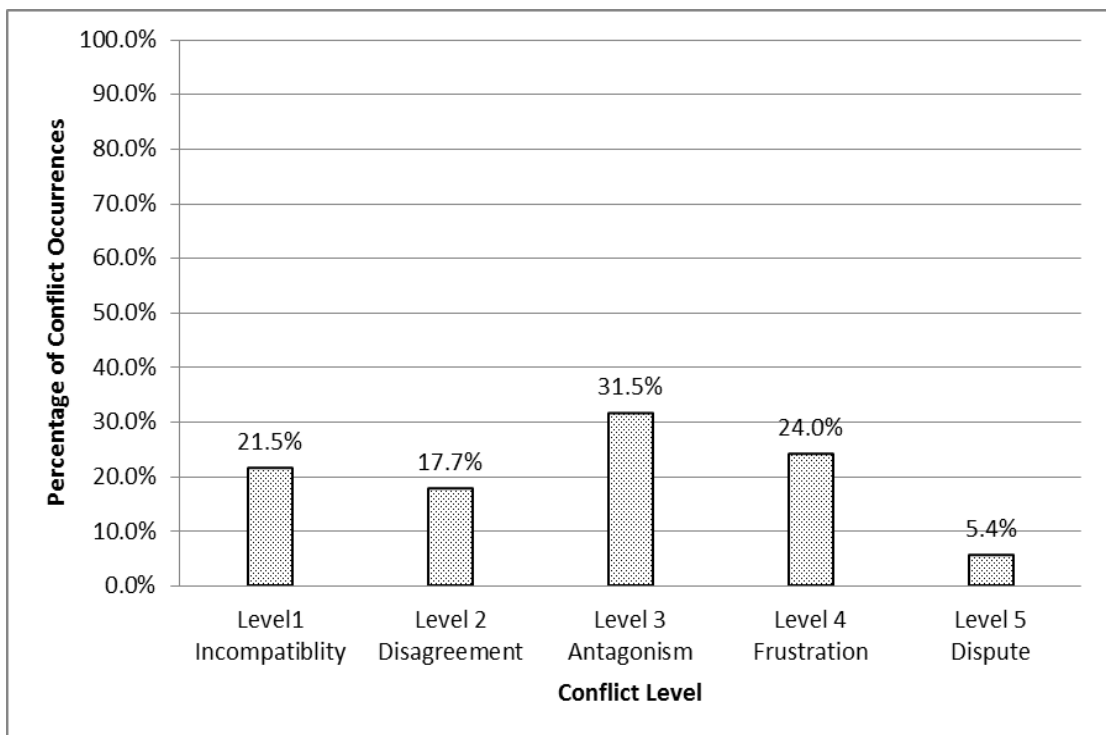


Figure 5.21: Conflict distribution on “Irresponsibility/ Lack of commitment/ attitude & personality problem”

The root causes of irresponsibility, lack of commitment, attitude and personality problem were poor working system, weak administration, no trainings given to specific field of interest, unfair allocation of work load, partiality, no motivation or reward systems, lack of clear understanding of service rules, lack of ethics and moral values, wrong person wrong job, no support from superiors, personal life and background and low pay grade of engineers (PO4, PO6, PO15, PO17, PO20

and PO24). Because of these reasons, most engineers were deprived and became irresponsible and did not show any commitment to the work. As a result the construction works were carried out by laborers at site. The contractors involved were also normally uneducated and less knowledge on project management. When it has never instructed and verified the works at site, the disagreement between the parties has started (PO17, PO20 and PO24). From the incompatibility between the parties, it had increased to level 2 with 17.7% disagreement.

Some public owners commented that, contractors need to be evaluated and selected based on personality, skills and attitude test because they said the contractors involved were ego centered and profit oriented (PO1, PO6, PO11 and PO17). The engineers should also be cognizant of ethics and moral values since it had driven with corrupted attitude of conspiracy and nepotism with the contractors (PO1 and PO6). However, the project had moved on with disagreements between the parties and sometimes they had tried to understand their problem and compromise on the work that were doing by laborers at site. Some client engineers had never turn up to site for verification and measurement even at critical point of work activities which had affected the work in terms of quality (PO24). As a result there had breakdown in communication between the parties and lost trust, respect and had lots of perceptual differences (PO24). Due to communication problem, it has misinterpreted the drawings and designs, misunderstood change order delays in delivery of critical components to site, failure to execute the instructions and led to more hostile situations (PO4 and PO23). From experiences of such situation between the parties, the public owner had evaluated to have 31.5% antagonism at level 3.

The ultimate impact of being irresponsibility of site engineer was the deviations and delayed the payment to contractors. The late information and verification at site was also another impact to project. In addition the poor quality of work and delayed the projects were also due to engineer's irresponsibility and lack of commitment shown (PO7, PO12 and PO23). And when the contractors has not executed the rework, it has frustrated the owner and didn't negotiate on any time and cost that had affected (PO13 and PO19). As a result the conflict had increased at level

4 with 24% frustrations. Moreover the contractors were irresponsible and had not provided the site engineers and supervisors at site according to the contract document (PO2, PO5 and PO24). Such contradicting issues had never compromise and settled between the parties. As a result the project got delayed. With the issue of incomplete project, everything had remained incomplete and no one was complete and able to settle the issue unless it's intervened by third parties (PO2, PO5 and PO24). Likewise, public owner had experienced 5.4% dispute at level 5 that occurred 100% conflicts during construction. Public owner's felt that relationships between the parties were hampered by the communication gap due to irresponsibility, lack of commitment, attitude and problems of all personnel involved in the public construction projects.

21. Level of conflict for “Unclear/Incomplete Technical Specification is conflict issue related to quality”

This is the common issue where many people don't want to spend time to specify every detail during planning and bidding stages. However, this issue of “Unclear/incomplete technical specification” has been evaluated by public owners and the level of conflict is 2.700. This issue is in moderate level of conflicts in public projects. The detail about distribution of conflicts at each level is given below in figure 5.22. The public owner had evaluated 15.8% incompatibility situation with the issue of unclear and incompleteness of the specification. The owners were inconsistent on the specifications because the technical specifications are prepared by inexperience personnel.

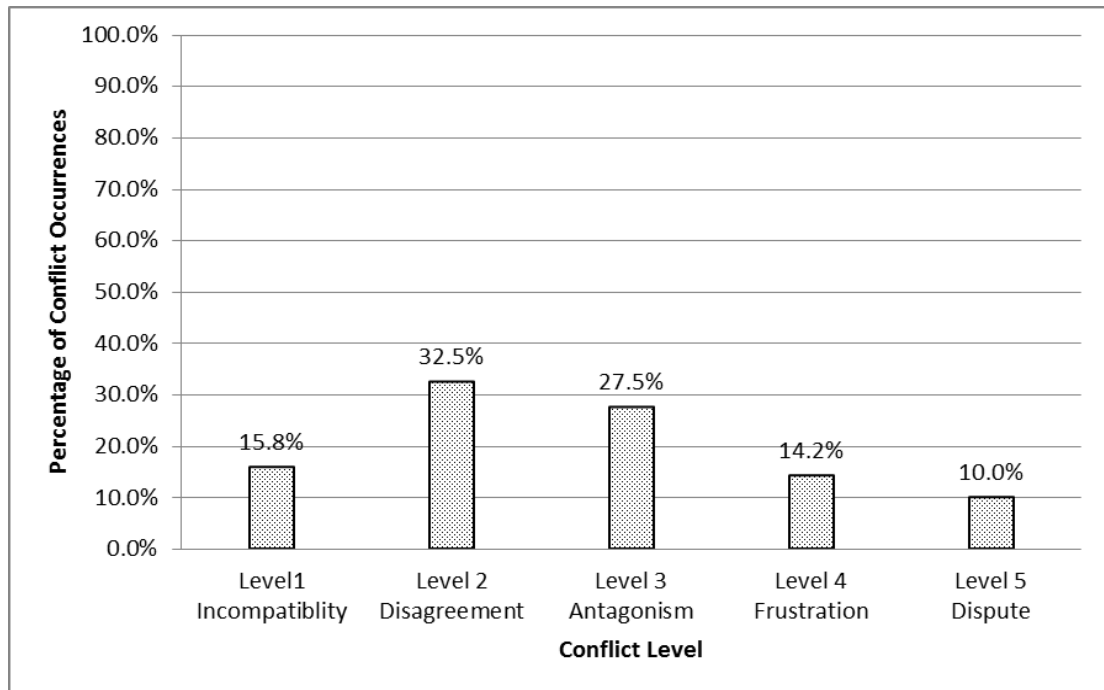


Figure 5.22: Conflict distribution on “Unclear/Incomplete technical specifications”

In addition, specifications were not practically reliable as no project based specifications are available. Moreover the contractors were not familiar with technical specification which they are required to comply with during construction (PO8, PO10 and PO23). They would have already started procuring materials and components required for the project as per material specification and quantities of BOQ items. Unfortunately, this situation leads to disagreements among the project parties on fixing the components regarding the change of materials (PO24). The materials and components delivered to site did not meet the standards (PO24). As a result the conflicts had increased to level 2 with the experience of 32.5% disagreement. Problem started to arise when the materials and components brought to the site was rejected by the public owner. The reason was mainly because of misinterpretation on technical specifications by contractors since it was unclear and incomplete one (PO11, PO20 and PO24). Although, it was the owner’s fault for the unclear and incompleteness of specification but argued that it was the responsibility of the contractor to get clarifications and have knowledge on it (PO12 and PO24). Moreover, contractors were instructed to rebuild poor quality works by the visiting committee members and

department heads. This was clearly due to lack of coordination and thorough review on specifications during planning phase. Moreover they were forceful and not bother about the impacts of changes likely to occur and eventful conflict situations (PO1, PO2, PO11, PO20 and PO23). From disagreement, it had led to 27.5% antagonism that occurred at level 3. There had also some unclear and mismatch between the specifications and the materials available within the country. In addition it creates more misunderstanding when contractors import materials from border towns of India but materials did not match with specifications (PO13, PO19 and PO23). But the public owners strict to the given specification even though there were mismatch of materials with specifications, mismatch of important clauses against work nature and some items had not reflected in the bill of quantities (BOQ). So, when it has not able to resolve such issues, it had led to more hostile situation. Some projects had cooperative environment and had discussed when issue arises during construction, re-specify, analyze and provided additional relevant specifications (PO4, PO21 and PO22).

The owner had experienced 14.2% frustration at level 4 when it had observed deviations in the work which was built by laborers without following the specifications. It had led to dismantling and rework. As a result it had affected the quality of the work and subsequently it lead to project delay (PO5, PO10 and PO16). It had not able to compromise and negotiate on delay and extra cost involved with the changed of materials components and rework (PO5 and PO18). In addition, the project uncontrollably delayed because materials were reordered from manufacturers who did not deliver on time and more time was taken for refitting the components that satisfy owner and committee. Further the extra cost involved for such activity by contractor remained controversial and led to 10% dispute. Thus it gives benefit of understanding the situation of conflicts that has experienced during construction due to unclear or incomplete technical specifications.

5.4 Result of Conflict Levels evaluated by Contractors

After deep interview and evaluating the level of conflicts from contractors on 26 important conflict issues, the data was analyzed to determine the conflict levels. The result determines top 14 critical conflict issues that have the conflict levels greater than cut-off value of 2.6. From the table 5.6 below shows the descending order of ranking the conflict levels. The description on evaluation of conflict levels on each of these 14 critical conflict issues are explained in the subsequent sections. All these explanations are supported by contractor's comments, experiences and knowledge on conflicts exchanged during evaluation process.

Table 5.6 Result of Conflict Levels evaluated by Contractors

Conflict Issues	Conflict Level	Rank
Unclear/Incomplete technical specifications is conflict issue related to quality	2.898	1
Late payment by client is conflict issue related to cost	2.893	2
Lack of detail drawing is conflict issue related to quality	2.820	3
Time extension due to design changes is conflict issue related to time	2.809	4
Frequent change orders causes uncontrolled project schedule is conflict issue related to scope	2.800	5
Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality	2.780	6
Slow decision making by client is conflict issue related to time	2.748	7
Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality	2.730	8
Lack of clear information to address the price escalation index is conflict issue related to cost	2.721	9
Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality	2.702	10
Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality	2.660	11
Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel	2.652	12
Irresponsibility/ Lack of commitment/attitude & personality problems is conflict issue related to personnel	2.638	13
Poorly develop project planning and scheduling is conflict issue related to time	2.622	14

Slow progress/performance by contractor is conflict issue related to time	2.596	15
Late approval or permit from regulators is conflict issue related to time	2.588	16
Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope	2.588	17
Errors in contract document & violating terms & conditions of contract is conflict issue related to contract	2.584	18
An unforeseen underground condition is conflict issue related to scope	2.578	19
No first aid & lifesaving appliance is conflict issue related to safety	2.564	20
Inadequate quality testing facility is conflict issue related to quality	2.564	21
Use of low quality & cheap materials is conflict issue related to quality	2.532	22
Different perceptions on work quality acceptance is conflict issue related to quality	2.430	23
Non-compliance with occupational health & safety regulations is conflict issue related to safety	2.394	24
Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope	2.226	25
Pollution during constructions and affect to environment is conflict issue related to environment	2.192	26

5.4.1 Evaluating Level of Conflicts in Public Projects from Contractors

1. Level of conflict for “Unclear/Incomplete Technical Specification is conflict issue related to quality”

The conflict issue of unclear or incomplete technical specification is the topmost issue evaluated by contractors. The conflict level is 2.898 which confirmed in moderate level of antagonism in public projects. The detail distribution of conflicts at each level is given below in figure 5.23. The level of conflict had arisen from the very low level with 18.4% incompatibility during construction. The contractors had inconsistency over the technical specifications provided by public owner for the particular project. The reasons were that the contractors concerned about public

owners never prepared project based specifications that meets specific requirement during construction (C3, C8 and C22).

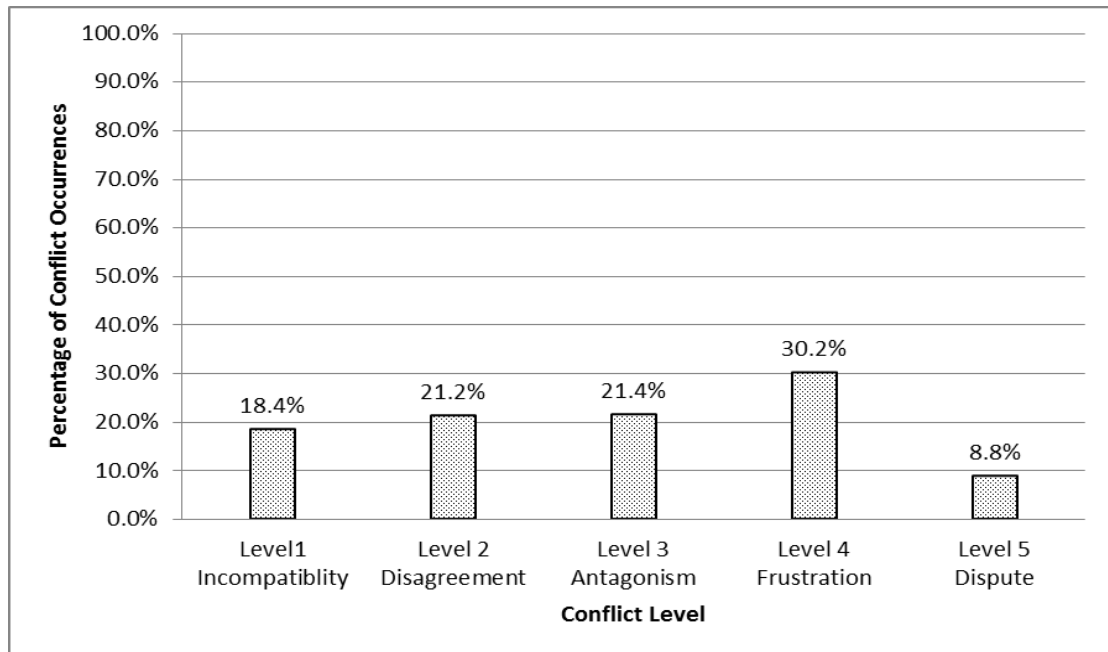


Figure 5.23: Conflict distribution on “Unclear/Incomplete technical specifications”

In addition, contractors were skeptical about the specifications because the public owner usually provided old and general specifications throughout for any projects (C5 and C15). Moreover the contractors had to follow the given technical specification which they are required to comply during construction. But the contractor had already submitted supply order for materials and components required for the project as per material specification and quantities of BOQ items. As a result there were disagreements on fixing the components regarding the change of materials (C25). The materials and the components delivered to site by supplier and manufacturers were not the one it was actually required as per the specification (C25). As a result the conflicts had occurred at level 2 with the experience of 21.2% disagreement.

There had more disparity when the materials and components brought to the site had got rejected and the contractors had incurred double expenditures. The reason was mainly because of misinterpretation on technical specifications since it was

unclear and incomplete one (C5, C15 and C25). Although, it was the owner's fault for the unclear and incompleteness of specification but argued that it was the responsibility of the contractor to get clarifications and have knowledge on it (C25). Moreover, the works done at site had made to change for what it like and think of best quality by the visiting committee members and department heads. This was clearly due to lack of coordination and thorough review on specifications during planning phase by public owners (C5, C12 and C25). Moreover public owners were forceful and not bother about the impacts of changes likely to occur and eventful conflict situations (C25). From disagreement, it had led to 21.4% antagonism that occurred at level 3. There had also some unclear and mismatch between the specifications and the materials available within the country, and it creates more misunderstanding when contractors import materials from border towns of India are not match with specifications (C1, C5 and C12). But the public owners strict to the given specification even though there were mismatch of materials with specifications, mismatch of important clauses against work nature and some items had not reflected in BOQ and specifications. So, when it has not able to resolve such issues, it had led to more hostile situation. At some projects had cooperative environment and had discussed when issue arises during construction, re-specify, analyze and provided additional relevant specifications (C5, C8 and C11).

The contractor had evaluated 30.2% frustration at level 4 when public owner had instructed to redo the works following poor quality of works due to the following of specifications. It had observed deviations in the work which was built by laborers and mistakenly followed the specifications. As a result it had affected the quality of the work and subsequently it had also delayed the project (C15 and C19). Contractors claimed that public owner had not able to compromise and negotiate on delay and extra cost involved with the changed of materials components and rework (C5 and C25). In addition, the project got uncontrollably delayed because the re ordered materials from manufacturers did not arrive in time and more time was taken for refitting the components to suit the requirements of owner and committee. Further the extra cost involved for such activity had not accepted by public owners and led to

8.8% dispute. Thus it gives benefit of understanding the situation of conflicts that has experienced during construction due to unclear or incomplete technical specifications.

2. Level of conflict for “Late payment by client is conflict issue related to cost”

Late payment by client is the most prevalent conflict issue related to project cost in Bhutanese public projects. However the contractor has evaluated to have moderate level of conflict in antagonism situation with conflict level of 2.893. The detail of conflict distribution against each level is shown in figure 5.24.

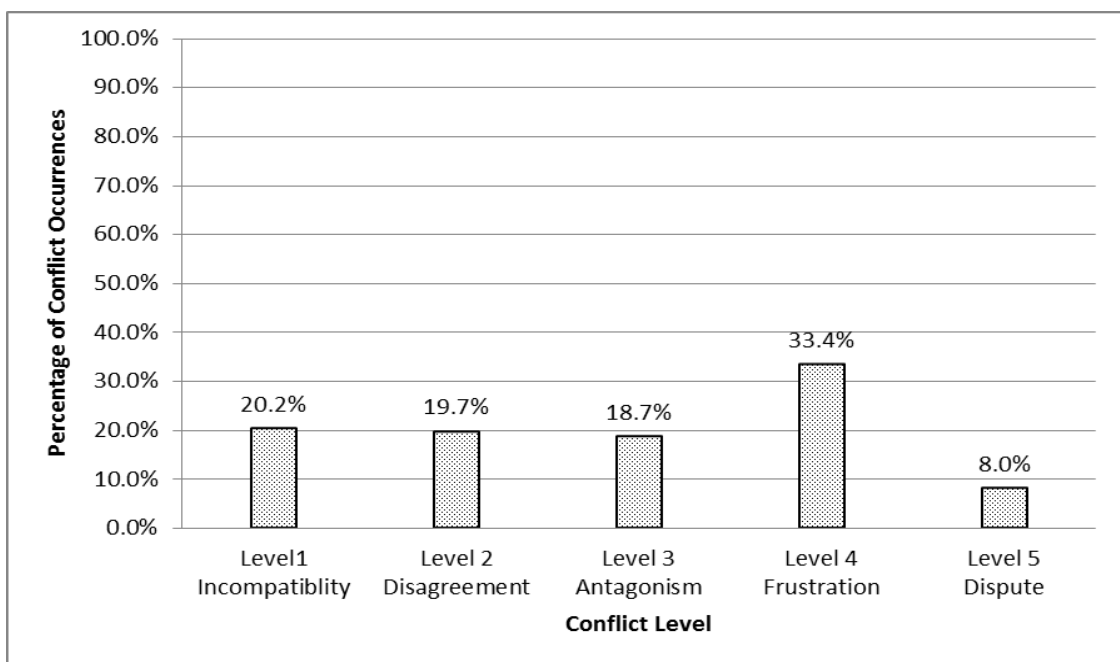


Figure 5.24: Conflict distribution on “Late payment by client”

First it had begun with the incompatibility of 20.2% at low level of conflict because they were aware of the late payment that would occur during construction. The reasons for incompatibilities were public owner’s weak financial management and led to budget lapses and shortages, late release of fund from concerned agencies and bureaucratic process or inefficient payment procedures practiced by clients (C1, C5, C8 and C19). At this stage public owner had negotiated with the contractor on bill payment by informing them that the payment shall be made depending on the availability of the budget or sometimes made payments to the contractors by using the

budget of other projects. But these underlying conflict issues had occurred at level 2 with 19.7% disagreements when public owners paid late to mobilization and secured advances. The disagreement over late payment had occurred when the contractor claimed more than the actual cost of materials brought at site (C8). However the public owner had tried to make payment on time and processed through finance and accounting team to review and make prompt payment but this has not happened (C8 and C19). Besides this the owner had also tried to re-appropriate the fund from different budget heads but the tender committee had not approved the proposal (C19). Moreover, the projects funded by donor agencies like the Asian Development Bank (ADB) and World Bank (WB) were immensely delayed for payment by client due to late release of fund (C8 and C19). As a result the conflicts between the parties had occurred with 18.7% antagonism at level 3.

The reasons were inadequate allocation of fund from financing source and delay in bill measurement and verification for interim payment. The frustration occurred when public owner said the submitted bills were false and incomplete. This has taken to do the measurement again jointly with the public owner (C19). Moreover, at this time the public owners were not available for joint measurement because of irresponsibility and busy with other projects (C8). In addition, owner has taken more time in evaluation and entering each and every items and quantities in measurement book before make payment which were tedious process and time consuming. Likewise the contractors were frustrated when payment process was delayed (C1, C8, C19 and C25). At level 4, the conflict had occurred more with 33.4% frustration. The contractors had accused that the client engineers were irresponsible and delayed the payment process despite of constant follow-ups. Some contractors blamed that engineers are assertive and tainted over certain amount for engaging in the project. Such situations developed as there was no specific contract clause defining the payment period (C19). The public owner argued that normally one month or more time was required for measurement and preparing bill including verification and entering into MB (measurement book). Similarly public owner expressed that accountant also required more than 20 days to verify and pass the payment from account section on time. Such contradicting issues and accusation had

reached to misunderstanding level between the parties and as a result it had led to dispute (C5, C9 and C15). The dispute experienced is 8% at level 5. Some contractors mentioned that public owners and committee had not satisfied with the final quality of works. So the owner had not accepted the project and accordingly issued warning for rectification. The final bill payment was withheld by the public owner unless the contractors repaired their defective works according to the standards. Some public owners had hold up the payments unnecessarily even after the project completion (C9). Such actions had broiled the contractors besides not having received even the interim payment (C15 and C19). Finally the issue was referred to the court by the contractor upon getting his payment rejected several times by the public owner.

3. Level of conflict for “Lack of detail drawing is conflict issue related to quality”

The level of conflict for this issue is 2.820 in moderate level of antagonism in overall as evaluated by contractors. However the explanation on conflicts distribution at various levels is given in figure 5.25 below.

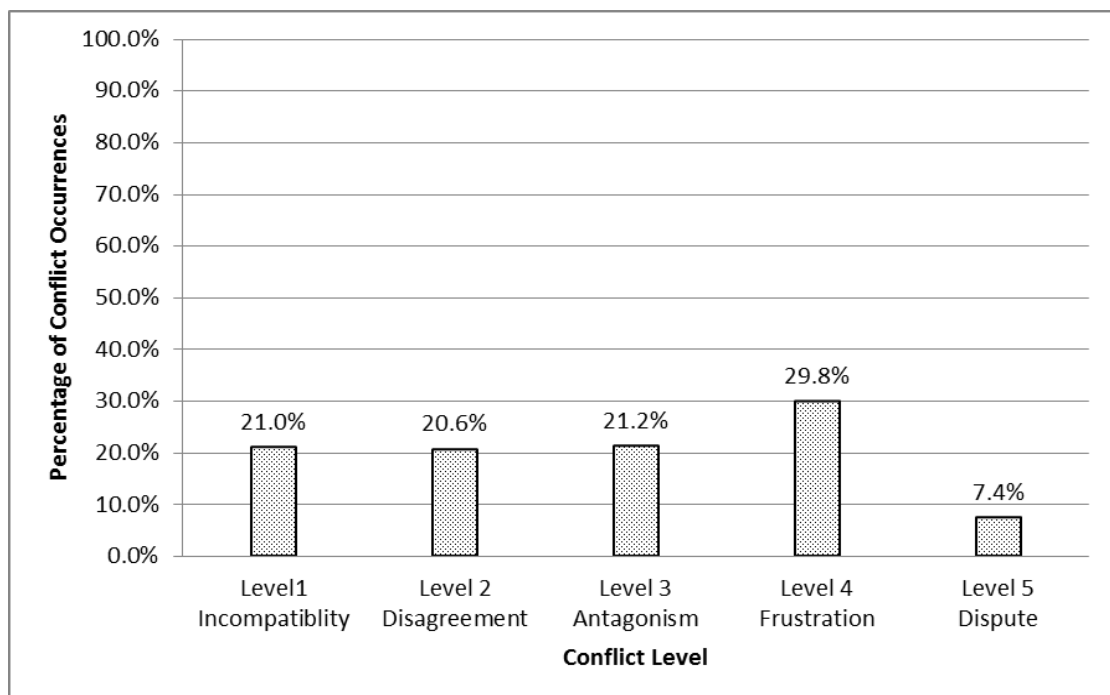


Figure 5.25: Conflict distribution on “Lack of detail drawing”

At the beginning, the conflict had started from very low level of 21% incompatibility. At this time, contractors were not confident of the drawings provided by owner because the drawings are usually designed by incompetent designers and engineers (C8 and C14). And contractors had also noticed the ambiguity, errors and missing in the drawing of component details and structural requirements but they couldn't make a big issue since the construction process was just begun (C4, C8 and C14). Somehow it had proceeded with construction activities and owner had provided the missing drawings and revised accordingly but in some projects the revision time was taken more than anticipated. In addition, the drawings that has provided was the old and outdated, copy paste design and prepared by inexperience engineer and incompetent personnel (C4 and C19). With this reasons and unresolved issues, the conflicts had increased to 20.6% disagreement.

The root causes for such situations were due to public owner's inexperienced designer, insufficient time for detailed drawings, poor understanding of the project components by designer, improper design, incomplete site investigation and survey (C6, C11 and C20). Combination of all these causes and incapable to manage on time had increased the conflicts from low to high level that has affected to project quality. The project quality of structure had affected when the workers had to frequently demolish and rebuild it as per the revised drawings besides being time loss and extra cost involved (C9). Because of these circumstances, conflicts had further escalated to more hostile and hatred situations during construction process with 21.2% antagonism. Often, the site engineers were tended to take the requirement of detailed drawings for granted and this has led to difficulties in revising the works at later stage during construction (C12 and C17). The public owners had cooperated on the mistakes and provided complete set of detail drawings on time with necessary changes as governed at site especially for the reinforcement and component fixing details (C8).

On the other hand, some engineers just visited the site accompanied by their department heads, committee members and forcefully instructed to demolish and redo when it was not satisfied with the quality of already built structure (C5, C15 and

C23). And even the public owner' constant follow-ups, long waiting for revisions and rework has frustrated due to designer's irresponsibility and not responding on timely approval and revisions (C7 and C23). Because at this time, it had deviated the work and project delayed as a result the issues had gone more sensitive with claims and rights over time, cost and quality due to the main issue of lack of detail drawings. That's why it experienced to 29.8% frustrations at level 4. Further even it had experienced 7.4% dispute making at level 5. The disputed situation was not only just because of lack of detailed drawings, it had been attributed by many other issues such as late payment by client, incompetency of the engineers to deliver right instructions and changes on time, inadequate supervision from both parties etc. (C8, C9 and C18). With all those attributing issues together with the lack of detail drawing issue, the project was not satisfied by the public owners, department officials and technical committee members during final inspection. They blamed that the final finishes and quality of work did not follow the provided drawings. As a result the public owners has postponed and withheld the payments and other securities unless it's rectified by the contractor (C8 and C23). Such condition was somehow accepted to perform by contractors but some argued that it was not easy as public owners just wanted. So contractors started to settle through other means of arbitration but in extreme case, the contractor submitted petition in court (C8).

4. Level of conflict for “Time extension due to design changes is conflict issue related to time”

The overall level of conflict for this issue is 2.809 as evaluated by contractors in public projects. This issue falls under moderate level of conflict and was obtained from their overall assessment on each level against the percentage of conflicts that has occurred during construction. The figure 5.26 shows the description about distribution of conflicts at various levels. The design changes were inevitability experienced by contractors during construction time and it has begun with 17.7% incompatibility from very low level of conflicts. The time extension request due to design changes were normally caused by public owner's incompetent designer with improper design data and information (C5 and C10).

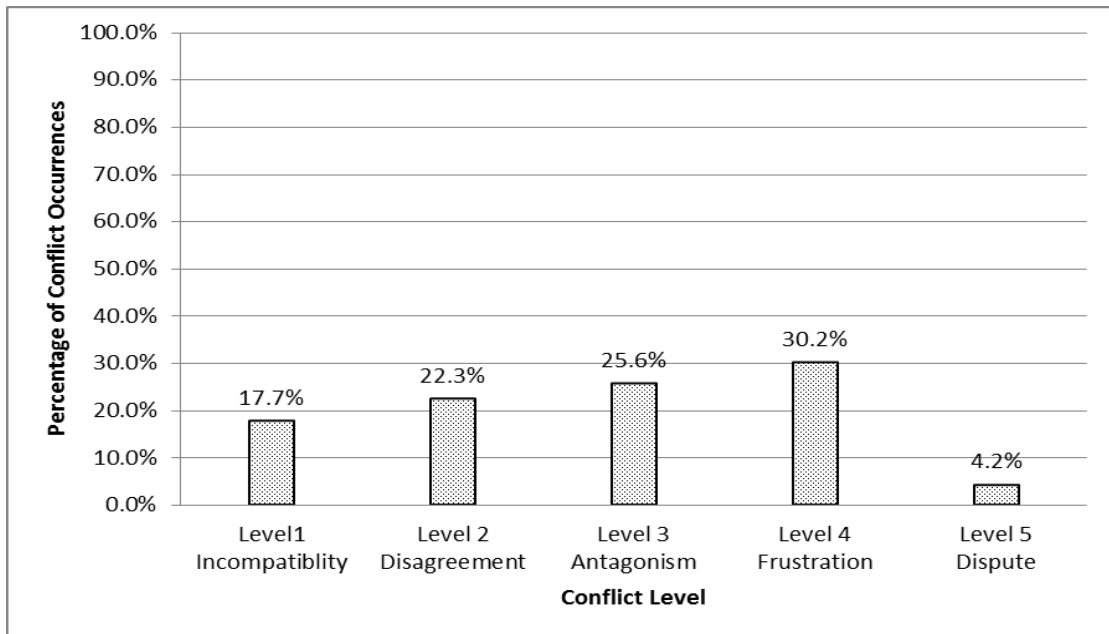


Figure 5.4: Conflict distribution on “Time extension due to design changes”

It had occurred disagreement with the public owner when there were long waiting for the redesign and changes, seeking approval from tender committee. Moreover the designs were not meeting actual field requirements and affected the subsequent activities (C5, C7 and C11). Without having resolved low level of conflicts over incompatibilities had led to 22.3% disagreements between the parties at level 2. The disagreements between the parties were mainly on delay of activities due to design changes where usually contractors make point out of it. However the public owner had asked contractors to expedite the work by doing the alternate activities while waiting for drawing revision (C5 and C8). The contractors were found to be most benefitting in this situation because they would be entitled for time extension. But the contract document did not provide adequate specification on the provisions of time extension due to design changes which are acceptable to both parties (C2, C5 and C16). Likewise, the conflict situation at level 3 had experienced 25.6% antagonism in more hostile situations and misunderstanding between the parties. The reasons were that granting time extension approved by committee had not satisfied the contractors because already built structures also need to change due to design changes which involves demolishes, rework, extra laborers and materials etc.(C11, C13 and C24). At one of the school building project, the conflict issue had gone wild with

public owner because it has not been able to satisfy and came over mutually agreeable condition over more variations in quantities and cost for overtime and reworks (C20). As a result, it had occurred to 30.2% at level 4 with frustration. This situation led to tension and more heated arguments over the additional works, delays and penalties for the delays (C11 and C20). Even at this level, the conflict in overall has not been able to resolve and as a result it had reached to very high level of conflicts with 4.2% dispute. The reasons for taking the matter to court was not only due to this specific conflict issue but contractors mentioned that it was also due to combination of other related conflict issues such as compensation for cost, quality and the increased scope of works which were beyond negotiation (C2, C13 and C20). As a result of unsatisfied claims over time, cost and quality as triggered by this conflict issue, the work had suspended and followed the court case.

5. Level of Conflict for “Frequent change orders causes uncontrolled project schedule is conflict issue related to scope”

The contractor has evaluated this conflict issue in moderate level of antagonism. The conflict level is 2.800 and the detail about conflict distribution in each level as experienced by contractors is given in figure 5.27. The contractor had evaluated 17.2% incompatibility over the frequent change orders that had caused uncontrollable project schedule during construction related to scope. The reasons expressed by contractors were because of the poor project planning and scheduling, influences during construction by public owners, department heads, interruptions and mistakes in design etc. (C3, C5 and C17). Apparently, it had led to 20.8% disagreement when there were change orders regarding to the change of position and building orientation. Actually the contractor had already completed the excavation and foundation work according to the original plan and setting. So, the change in orientation and setting had caused new earthworks and foundation layout where the scope changes were taken place (C4 and C9). The public owner did not calculate the scope change, time and cost involved due to the change order. As a result the contractor and public owner had more disagreement during construction.

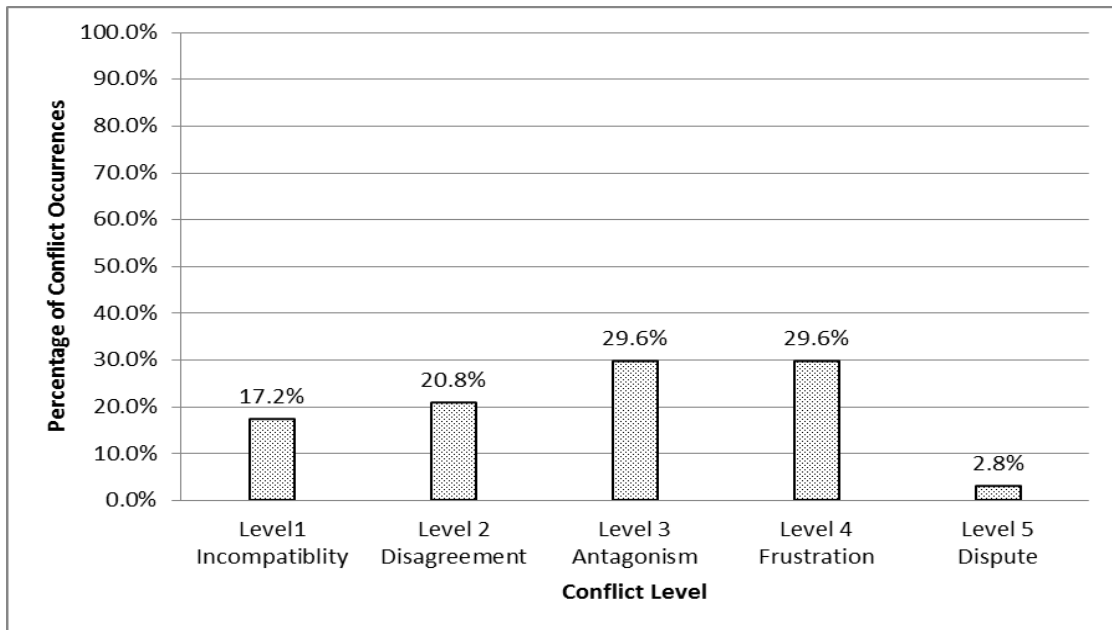


Figure 5.27: Conflict distribution on “Frequent change orders causes uncontrolled project schedule”

During urban road construction, the contractor (C9) had experienced numerous changes in road alignment and changed the scope of works due to frequent change orders. The reasons were due to improper planning that has invited public interruptions due to land issue and property damages in the vicinity. With the frequent change orders, there had no adequate compensation for time and extra resources engaged during execution of changed works. As a result, the laborers and contractors were not happy with work done at site (C9). However, the public owner had provided adequate information for the changes with drawings and compromised with the contractor on time. But public owners were not happy with the frequent change order received because it caused uncontrollable project schedule and changed the scope of works (C5, C6, C11 and C19). The conflict had occurred at level 3 after it had experienced 29.6% antagonism and hatred between the parties.

The frequent change orders had brought deviations in scope of the work and the contractor had started claiming the extra cost and time hindrances. But their claims were not accepted by the department committee arguing that the contractor did not follow the original plan and layout given in contract document. As a result the

contractor had evaluated 29.6% frustration at level 4. The frustrations between the parties had more during construction when there were more deviations in quantities due to frequent change orders (C9). The project had delayed and the hindrance claims were rejected by the department committee. The work had not able to control with the proper schedule. As a result there was more confusion and mishaps with the activities when resource shortages occurred at site. At times the contractor was not able to control the project and got delayed beyond the normal schedule by 40% (C9). Somehow, the owner had incorporated the scope variations and hindrances but the contractor was not satisfied against the actual claims and work done at site. Meantime the owner had suspended the project and stopped the payment (C9 and C 5). Thus the conflicts had occurred at very high level as evaluated by contractor with 2.8% dispute due to this problem. It gives benefit of understanding the situations that has experienced by public owners during construction phase.

6. Level of Conflict for “Inadequate supervision, regular inspection on construction site by client engineer is conflict issue related to quality”

Overall, the conflicts experienced during construction phase by contractors were in moderate level of conflict in a situation of antagonism with average conflict level of 2.780. The distribution of conflicts at different levels with this conflict issue is given in figure 5.28. It had begun with 25% incompatibility with public owners during construction phase. The root causes for having incompatibility over this conflict issue are due to lack of adequate staff to monitor the works, irresponsibility and lack of commitment by client engineers, shortage of skilled manpower especially engineers, lack of adequate training and knowledge in construction field, too many works at a time and overloaded, dispersed site and transportation problems, lack of management skills and communication problems (C1, C4, C8 and C16). With all these reasons it had led to inadequate supervision, regular inspection and verification at site and affected the quality of the works. The laborers were not able to interpret drawings and specifications. As a result the client engineers accepted whatever work was carried out the labor contractor (C6 and C9). But the quality of the works was not

acceptable to the public owners upon inspection. As a result the conflict increased to level 2 with 17.8% disagreements.

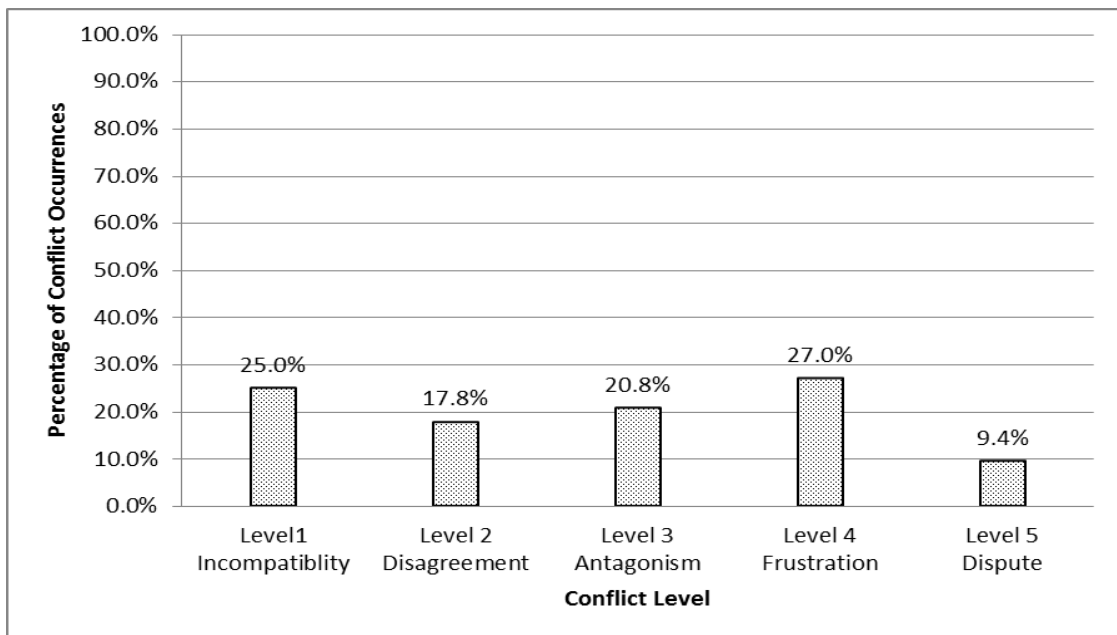


Figure 5.28: Conflict distribution on “Inadequate supervision, regular inspection on construction site by client engineers”

Furthermore, the quality of work has affected when client site engineers did not inspect the works on time. However the weak point of personal assessment was that connections between contractor and client engineers had influenced decision during control of quality of works. Mostly in remote construction, the contractor’s relationship with supervisors had certainly affected the decisions during inspection of the works (CAB secretary). Such relationships had fostered through past project relationships, obligations, gratitude, power and influence and out of bribery. In other projects, in absence of the regular site supervisor at project site, the labor gang leader (labor contractor) had the authority of overall site even when they were not qualified to interpret drawings, specifications and contract documents (C5, C9 and C20). When public owners periodically inspected the site, they instructed the contractor that the works should meet the quality according to the standard. But the contractors were not happy with reworks because it meant extra cost and time. However, it had tried to compromise and provided assistance by public owners on supervision and verification

at projects, but the project had still difficult to control quality since its site engineers were overloaded with too many sites at a time (C5 and C23). Ultimately, the crooked workmanship and not followed guidelines and drawings at site have affected the quality of works (C7 and C9).

With the effect on quality and result of reworks, the project had left behind actual work schedule and plan. The deviation in quality had led to deviation of time and becomes the issue of more arguments between the parties. As a result the contractor had experienced 27% in frustrated situation because it had observed structural deviations in concrete beam alignment which was unacceptable to department (C23). Because the contractor laborers at site had used irregular formworks for concrete works, used insufficient rebar detailing in slab reinforcement layout, improper curing of concrete works etc. Such carelessness of the laborers, improper verification and instructions to check and control construction process had frustrated the situation (C7 and C23). At such event, contractors put the blame on the client engineer's inadequate supervision and irregular inspection at site despite of their request (C7). Contractors became frustrated when their bills were not paid but instead issued warning letters transferring the full risk of structural safety and its liabilities. This made to have occurred 9.4% disputes because of the above reasons. So, the project had been suspended and stopped from continuing the works, because it had already failed in quality of works. Thus it gives direct benefit of understanding the conflict situation that has experienced during construction due this issue at moderate level of conflict.

7. Level of Conflict for “Slow decision making by client is conflict issue related to time”

The conflict level for this issue is 2.748 evaluated by contractors. Thus, this issue falls under moderate level of conflict. The distribution of conflicts at various levels for this issue is given in figure 5.29 below.

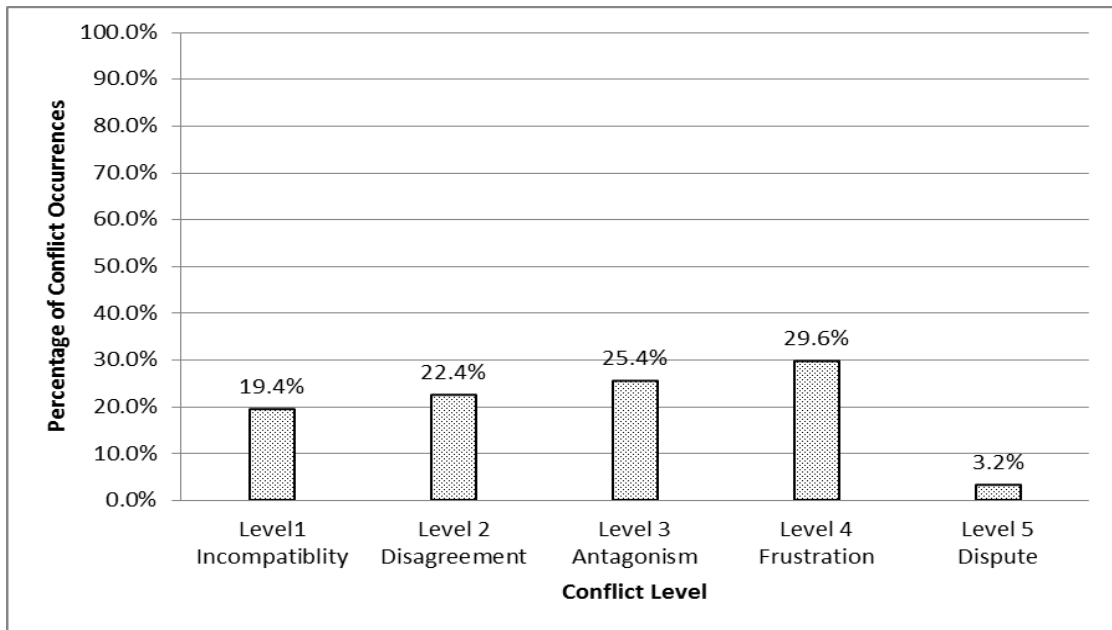


Figure 5.29: Conflict distribution on “Slow decision making by client”

The reasons are that effective and timely decision from client had been necessary for projects to be completed on time and to avoid delay when it had required many changes and disruptions during construction (C1, C9 and C12). And, contractors had expressed that the department office and officers in-charge has not been satisfactory in providing timely decision to project and moreover it has been argued that the decision making process are very long administrative and bureaucratic system which has to root from hierarchical persons involved. Because of such process, it had evaluated to have 19.4% incompatibly over the construction process and worried about the delay of project due to not getting approvals and disseminate timely decisions required at project from public owners.

The committee members and person involved for decision making process were mostly non-technical personnel who lacked expertise on contract and procurement process. This has made the decision making process lengthy as the committee needed the decision to come from top level of officials. As a result of slow decision from client, it had occurred 22.4% disagreement when it had started to delay the works. The conflicts due to such issues were experienced at 25.4% antagonism at level 3. The project had delayed as explained by contractor when it was not easy to

run the normal activities as per schedule (C9 and C20). At some infrastructure projects, contractors mentioned that site engineers had not taken any risk but waited for the tedious process of decision making (C3, C6 and C19). In such situation it had controlled the project by compromising and negotiates on time by prioritizing the activities. On the other hand, the project got delayed and the public owner blamed it on the performance of the contractor and rejected further time extension (C13 and C22).

As a result it had computed conflicts at level 4 with the experience of 29.6% frustration. The contractor said it had gone so controversial with public owner; however the slow decisions are resulted from top decision makers such as from department and ministerial tender committee. As such when the decision had kept pushing at end time of project, the frustrations had intensified with more deviations and delay occurred to the project (C15 and C20). The argument with owner had gone more because it affected to normal project schedule and slowed the performance while waiting for decision (C20). For instance the client had failed to give concrete decision on hindrances claimed for delayed of project caused due to submerged of wall foundations constructed during monsoon (C18). Such non-cooperative and uncompromising situations had forced contractors to evaluate 3.2% dispute due to this issue of slow decision making by client.

8. Level of conflict for “Ambiguous instructions and unqualified/ unskilled operators or worker is conflict issue related to quality”

The contractor had evaluated this conflict issue and obtained conflict level of 2.732. In overall view, the conflicts experienced during construction phase are in moderate level of antagonism. The detail about conflict distribution on each levels based on contractor’s evaluation are given in figure 5.30 below.

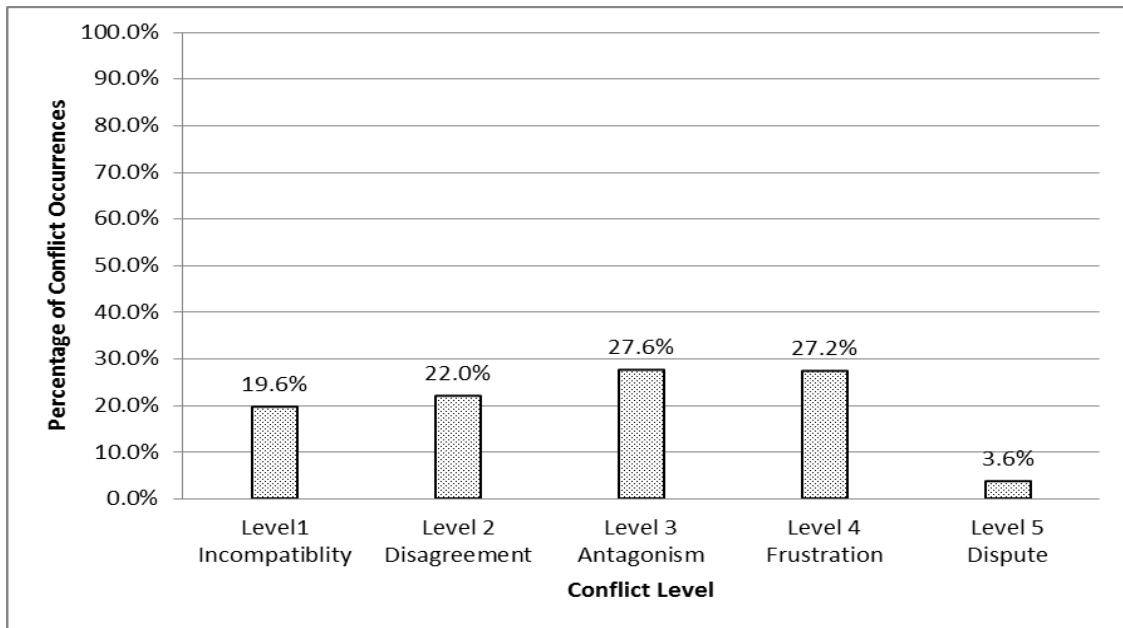


Figure 5.30: Conflict distribution on “Ambiguous instructions and unqualified/unskilled operators or worker”

The conflict related to project quality due to ambiguous instructions and unqualified/unskilled operators or workers had been started to have incompatibilities when it have seen ambiguities in contract, specifications, drawings and participation of unskilled operators and workers to the construction project. So the incompatibility evaluated by contractor is 19.6% at level 1. Likewise the disagreement had started when there was no clear distinction between mobilization period and actual start date and that has resulted into divergent thoughts of work completion date (C5, C10 and C19). Somehow with the start of the project, the public owner has still not able to convinced it and clarify on the actual start date with the site possession and mobilization period that contractors wanted. Such ambiguous instructions and involvement of unskilled operators and workers had evaluated conflict at level 2 with 22% disagreement between the parties. The root causes of having involvement of unskilled workers are due to lack of adequate knowledge on contraction practices, local workers lack expertise and skills and do not want to work as casual workers (C11, C13 and C21). In addition, there are no timely training and update knowledge to engineers and workers as a result most of them were unable to interpret design drawings and specifications, lack of awareness on modern technologies and

construction methods (C8, C13 and C23). Some engineers were lack experiences in similar projects, cheap laborers recruited from India, interference on instructions and decisions by department, division and section heads as some are less qualified, unskilled, non-technical and lack adequate knowledge on engineering and construction (C8 and C23). Because of such reasons, the instructions from site engineers and supervisors were unclear and as a result the unskilled operators and workers had carried out the work based on their own experiences, judgment and forcedly done at site (C8).

It might be right or wrong but when the quality of works were not satisfied by the public owners, it instructed to demolish and reconstruct as it have deviated from the drawings and specifications. But the contractors had not easily accepted to the instruction for rework (C2, C8 and C20). So when the performance and workmanship of the workers are very poor and unwilling to do rework, the situation had gone more hostile with 27.6% antagonism between parties in at level 3. At this level, more misunderstanding and hatred among workers, supervisors and site engineers had occurred due to severe lapse and deviations in work due to poor communication and unclear instructions. Despite having coordination meetings at site, it had been not easy to resolve the issues because it had occur more deviations in the scope of work that required extra costs and time (C8, C9 and C14). For instance the labors and welders had welded and built the tubular trusses with wrong sizes of 110mm instead of 90mm for school building roof and that had increased with additional weight of 2000kgs. The site engineer had the difficult situation, of course his job was to instruct contractor to remove it immediately, but the contractors had compromised on the quality of work (C21). Such situation has broiled to more frustrations between the parties. That's why it has evaluated to have frustration of 27.2% at level 4. The heated arguments and claims had started between the parties. The public owners were one sided because of the risk and substandard quality of the structure built and other liabilities, but the contractors blamed on the engineer's unclear instructions and improperly interpreted to workers (C9, C15 and C21). The issue was not only on the quality; it was also on the resultant safety and structural stability besides the time and cost overrun (C15 and C21). The case has not able to resolve it; somehow the

contractor had cover the roof but the public owner had not accepted the project and still the bills were suspended (C21). Such experiences by contractor had occurred at 3.6% dispute. The public owner had written letter stating the project can't be accepted and payment of bill shall withhold unless it change the roof truss as per the drawings and specifications. This has made unfair instigations to contractors and put up the case to court for final judgment. Thus it revealed that the ambiguity in construction projects leave lots of area of possible high level conflicts due to work quality issue and consequent causes of cost and time overrun.

9. Level of conflict for “Lack of clear information to address price escalation index is conflict issue related to cost”

The lack of clear information to address the price escalation index is the conflict issue related to project cost and evaluated conflict level 2.721. This is in moderate level of conflict as evaluated by contractors. This level of conflict was obtained from percentage of conflict occurrence distributed against each conflict level as shown in figure 5.31. First it begins with 23.4% incompatibility and the reasons were due to lack of well-defined about prices escalation in bidding document, no detailed market survey and unrealistic BOQ prepared based on invalid Bhutan Schedule of Rates (C4, C5, C9 and C22). Foreseeably, the conflicts had occurred at level 2 due to occurrence of 20.7% disagreement between the parties. The disagreement between the parties had occurred when it had not able to compromise on the rates of each items due to seeming changes or price escalation experiencing in the market due to recent economic crisis (C5). The contractor expressed that both parties were not in position to defend on the market price fluctuations that actually had influenced the construction material prices. The unprecedented price escalation for construction materials over the last 2 years since its Indian currency crunch in Bhutan has caused significant difficulties for most contractors (C10 and C19). Moreover, the prices for every construction products had seen intense increased in each of the last few years. As a result contractors had faced hardships to manage actual project cost with the fluctuating market prices.

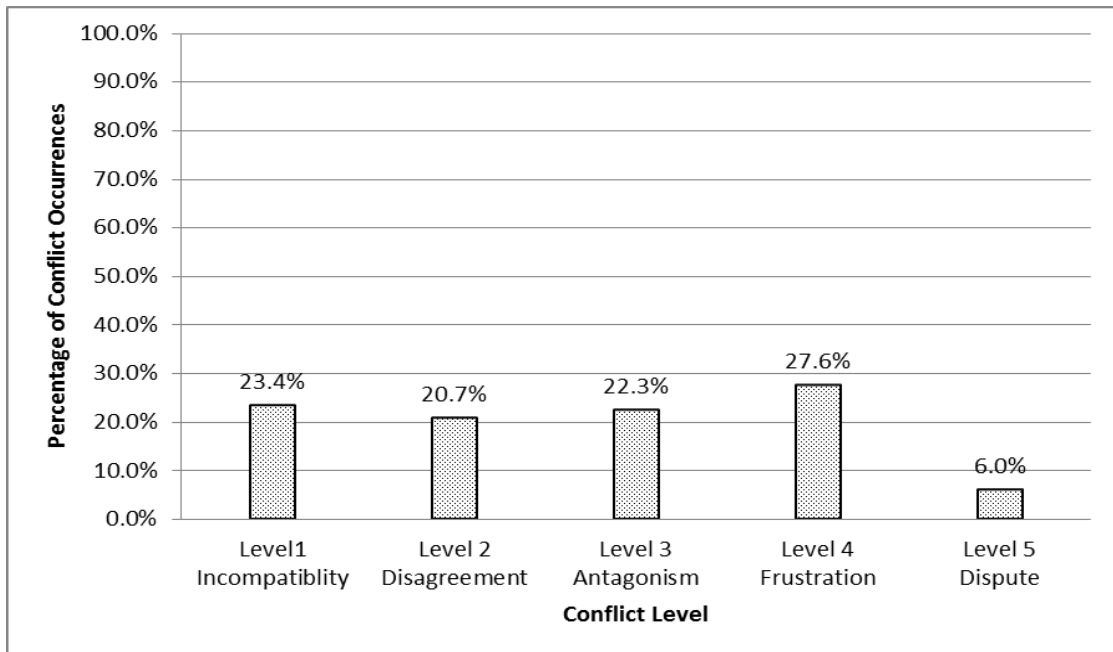


Figure 5.31: Conflict distribution on “Lack of clear information to address price escalation index”

In addition, contractor mentioned that there were unclear about price escalation formula in contract document. So the public owner had not accepted the rate analysis submitted which was done based on the rates collected from suppliers and manufacturers (C1, C8 and C10). As a result the conflict has experienced 22.3% antagonism and 27.6% frustrations among the parties. The public owner had always emphasized and insisted on time and quality with construction progress but the contractor was unable to cope as instructed due to hardships in getting materials. Beside its escalation of materials prices, dramatic increase of labor rates, the energy and transportation cost also had increased rapidly in Bhutan (C10 and C22). For instance there was 38% increase in fuel prices in recent situation that has frustrated general public and not only construction practitioners. Another factor that has instigated to unprecedented escalation of cement, steel prices and other material price spikes was the market demand because of immense infrastructures (hydro projects, rural roads, municipal developments etc.) and housing projects (institutions, schools, health centers, public buildings, recreation facilities etc.) are ongoing in the country (C6, C18, C21 and C22).

The more frustrated situation had experienced when public owner rejected the rate analysis submitted for each deviated items. The contractor mentioned that the contractors had to negotiate every time on government rates besides its rapid increase of market prices. In fact, both parties had difficult to negotiate on the rate analysis because the contractor submit analysis based on prevailing market rates at that moment whereas the public owners particularly based only to BSR (Bhutan Schedule of Rates) and material coefficients prescribed one or more years earlier (C5, C9 and C20). Such futile situation has experienced because the project duration were more than one year and the variations were extremely high. Nevertheless, the public owner had also attempted to negotiate in some projects by incorporating 7% escalation index based on assumptions and mere facts in which the contractor was not satisfied with that and even with the Indian Price Index method given in document (C3, C9 and C20). The main reasons are that the construction industry doesn't have producer price index (PPI) for construction materials and components, no input price index (CPI) and seller price index(SPI) unlike other developed countries to measure every changes in the prices of inputs to construction process and construction output on monthly or quarterly basis (CAB secretary). With those unresolved issues and lack of clear procedures, it had led to 6% dispute since it has not able to negotiate on the rates due to large variation in the price from the original contract amount.

10. Level of conflict in “Poor workmanship or rework due to non-compliance with methods and good practice is conflict issue related to quality”

The conflict level for this issue is 2.702 in moderate level as evaluated by contractor. The contractors had inconsistency over the workmanship of the laborers and lot of contradictions with the construction methods and practices performed by contractors because the current construction practices are still traditional and non-professional (C12, C17 and C20). They were concerned and worried about the quality and final finishes of the structure (C4 and C12). In addition the construction had engaged with unskilled laborers and incompetent workforce. So, the conflicts had started with 13.6% incompatibility over the construction practices and workmanship.

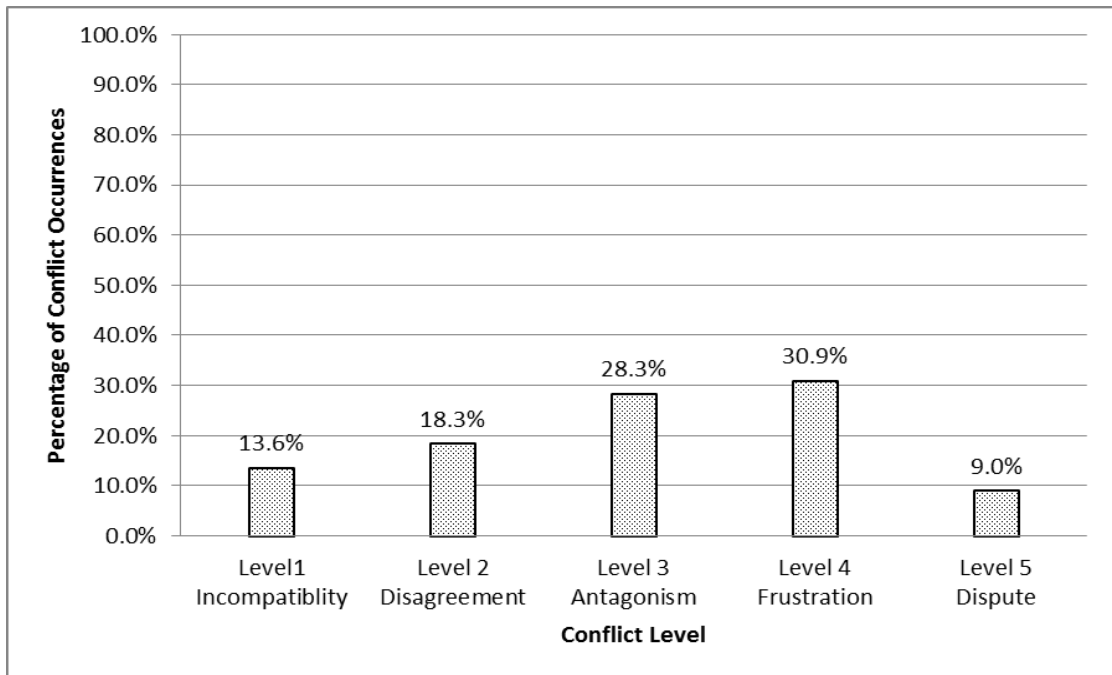


Figure 5.32: Conflict distribution on “Poor workmanship or rework due to non-compliance with methods and good practices”

With the start of the project, the public owner had observed poor workmanship done by the unskilled workers and nothing done as per standard practices and professional. As a result the labors had been instructed to redo the work but the rework has not been accepted by contractor (C4, C17 and C22). With differences between parties, there had occurred 18.3% disagreement at level 2. However, the root causes of rework were basically due to poor workmanship by unskilled laborers, insufficient and incompetent supervision, use of wrong materials, drawings errors, misinterpreted drawings and specifications, improper work sequencing, improper work protection and safety issues, lack of coordination and meetings, poor communication between field inspectors and constructors, lack of quality control commitment and lack of good construction methods or standards (C3, C8, C23 and CAB secretary). With all these causes had further occurred at level 3 with 28.3% antagonisms. In some projects, it had tried to cooperate among the parties to perform the rework and built to meet required quality of works (C7 and C18). And also the qualities of work were poor because site engineers were lenient, not able to instruct laborers and allowed the workers to perform based on trial and error method (C23).

Some site engineers exposed that they just supervised and rectify what they know best without any adequate knowledge on any modern construction methods (C20 and C23). However in the meantime the public owner had asked contractors to recruit more numbers of skilled laborers and competent supervisors' especially vocational trained personnel at the project.

As the project progresses, the owner found that the contractors had continued the work with old gang of laborers and not engaged the skilled laborers as agreed during the meetings. So the owner had decided and demolished the work in which the quality of the work was not satisfactory (C7 and C23). The impact was the delay of project and contractor were unhappy with impose of penalties and running on reworks. At this stage, the conflict was quite higher with 30.9% frustrations at level 4. The reasons are that there are no performance guidelines, professional corrective actions and quality control tools in time check and rectify the works (C3 and C23). It has been always the layman practices without any scientific and engineering practices introduced yet in the construction industry. The plants and machineries used also do not serve all purpose of construction work activities. They depended on imported second-hand and outdated equipment. Moreover most of the equipment won't be available at site. Such delayed in making available of plants and equipment to site had brought about financial repercussion and troublesome holdups in the site and land up in doing layman jobs where the qualities of works were badly affected. Unfortunately, no Bhutanese contractors have ISO certification and recognition to have the capacity in preparing and maintaining the quality control programs. Due to all these factors had contributed to poor workmanship and affect the quality of work (CAB secretary, C18 and C23). When quality of work has been unsatisfactory, the contractors were stopped from progressive payment of bills and had imposed penalties for the project delayed (C2, C18 and C23). In some project, the contractors had become irresponsive and neglected the site (C15 and C23). On the other side, contractor had fired back by putting up the case instead of accepting the rework and complete the project as instead from committee (C8). Such cases of disputed situation had occurred at 9% dispute.

11. Level of conflict for “Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality”

The contractor has evaluated this issue of “Non-compliance with quality control/quality assurance system or processes” and the conflict level is 2.66. This conflict issue is in moderate level of antagonism as experienced by contractors during construction phase. In the normal construction practice in Bhutanese public projects, there have been no definite quality control and assurance systems or guidelines being followed in the public projects. It has remained the complacency of the project implementers and accepted whatever comes and done at site asides of simply referring to drawings and specifications provided. This kind of lethargic practice of construction works has always leave room for conflicts because at the end everybody wanted to have good quality of work finishes and becomes risk-adverse (C1, C4 and C20). As such the consequences are the conflicts and it has ignited with 23.6% incompatibility situation between the parties during construction as shown in figure 5.33. The contractors were normally asked by owners to prepare and submit QAP/QAS before the start of project but most of them were not aware of the quality control and assurance system and incompetent to prepare QAP/QAS (C1, C9 and C14). So during that time, public owners had insisted by giving second chance and warning notification transferring the risk and liabilities at some public projects especially in building projects (C4 and C9). In other projects, contractors mentioned that the public owners had imposed lump sum amount of fines and forfeited the 10% performance security and increased defect liability period to 2 years (C4, C8 and C15). Somehow at some projects, the contractor’s engineer has prepared and submitted QAP/QAS as per the contract but it has never been practical at site (C12 and C15). But most often the public owners reminded only when quality of the work are not up to the expectations. At that time, both parties tried to compromise and agree each other on whatever they agreed to do and make work quality better but it was not the case in all projects as expressed their experiences by different participants (C7, C8 and C19). In due course of time, the conflicts had occurred at level 2 when they started to have disagreements between the parties. The 22.3% disagreement between them had experienced when the actual works performed were not according

to standards and not following the professional job as they don't have the QAP/QAS to comply with quality control program and assurance system (C4, C9 and C23).

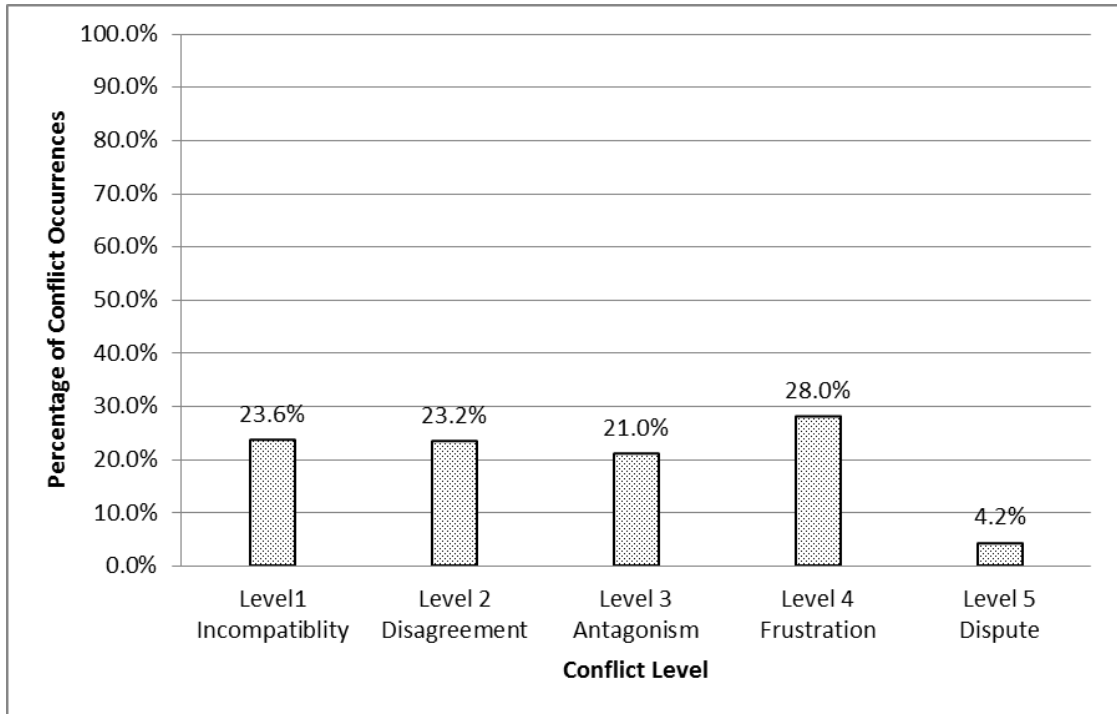


Figure 5.33: Conflict distribution on “Non-compliance with quality control/quality assurance system or processes”

The public owner had not accepted what it has built at site by laborers; the issue from disagreement has gone to more hostile situation between the parties (C7, C8, C12 and C22). It has never been easy to resolve the conflicts as mentioned by some of contractors that when walls, window frames, cornices (architectural features), wood sliding, cutting-bending of reinforcement bars, RCC concreting works are being done without guidelines and standards to follow and achieve good quality finishes (C22). Moreover, contractors mentioned that there were impossible for them to have field testing and inspection done with field quality program or quality systems at this level of capacity (C4 and C22). Unfortunately none of the construction companies had ISO certification and recognition to comply with quality plans and requirements of ISO 9001:2000 etc. Thus, the unresolved conflicts had occurred at level 3 when it had experienced 21% antagonism between parties. On the other hand, contractors had argued that public owners randomly visited the site for demolishing and pressurizing

the laborers for change of materials and caused rework (C5, C9 and C19). Such situation had frustrated both parties when contractor's work was not accepted for poor quality and when project had tended to delay and incurred extra cost (C4). As a result, the conflicts have evaluated at level 4 when it had experienced 28% frustration among the parties.

Further it has led to disputed situation with 4.2% occurrences when it has not able to manage from both parties (C18 and C22). The contractors expressed that the reasons for dispute with the quality issue was not only just because of this issue of non-compliance with quality control and assurance system, it had also contributed from different issues such as time, cost, safety, scope and personalities of the people involved during construction time (C11, C18 and C22). The work had been suspended by public owner blaming on the failure work quality and not completing on time. The contractor said, the public owner had not entertained any deviations and extra cost claimed (C8 and C11). It had gone so inexcusable to confront on the situation after all the project had been suspended and even the payment for completed works was also cancelled by owner.

12. Level of Conflict for “Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel”

This conflict issue has been evaluated by contractor and the conflict level is 2.652. This is in moderated level of conflict in a situation of antagonism. The detail on conflict distribution on each level can be understood from figure 5.34 given below.

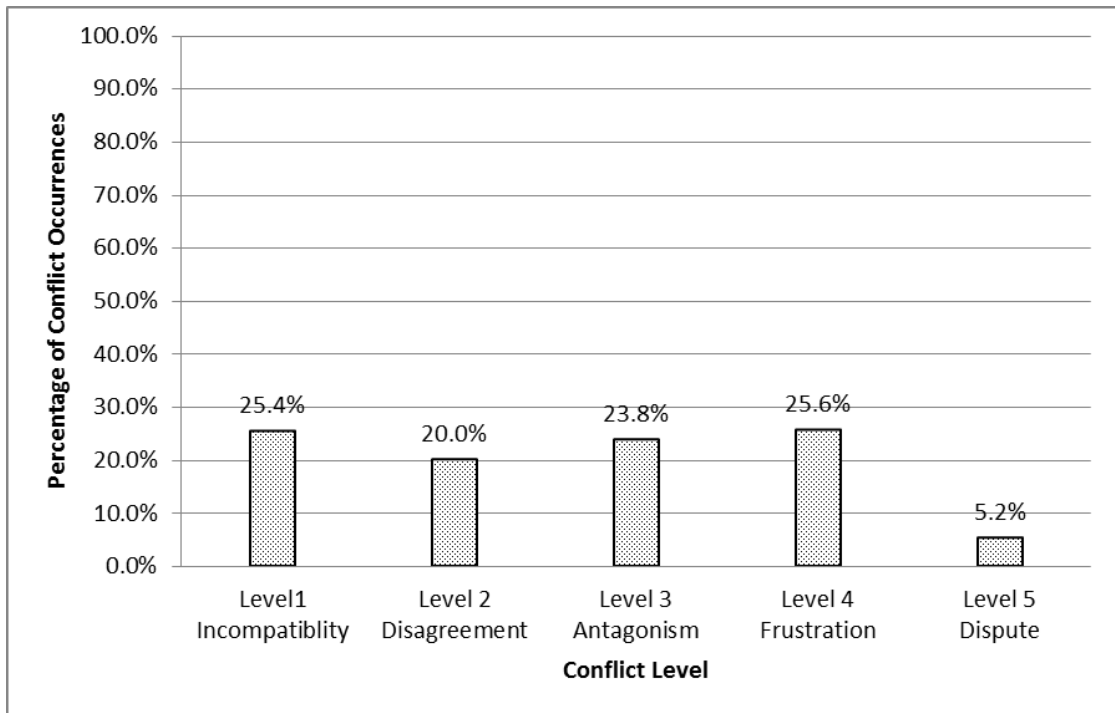


Figure 5.34: Conflict distribution on “Shortage or absence of competent technical, managerial or supervisory personnel at construction site”

The contractor has experienced 25.4% incompatibility. The root causes for incompatibility over absence and shortages of competent technical, managerial or supervisory personnel at construction site are shortage of manpower in market, lack of training, more number of projects at a time, high demand by engineers, competent engineers not willing to work in construction firms, no encouragement and less payment, and the construction industry itself is not fully fledged to have competent technical, managerial and supervisory personnel at projects (C8, C16 and C22). With all these reasons, the public projects had suffered with time and cost overrun, poor quality and enormous variations in quantities and change in scope, accidents at site etc. due to lack of proper project controls and tracking by the competent personnel at site (C1, C4, C11 and C22). As a result the conflict evaluated by contractors at level 2 is 20% disagreements between the parties. The contractors mentioned that they don't have site engineers and supervisors for all projects however they had managed to control the projects. Without having the regular site engineers and supervisors from contractor's side at project site, the labor gang leader (labor contractor) carryout the site activities but they are not qualified to interpret all of the drawings and

specifications and contract documents. The ultimate outcomes from their performance at site were deviations and lots of faulty construction (C5, C9 and C13). Such conditions had made to experienced conflicts at level 3 with 23.8% antagonism between the parties. The public owners had not cooperated and understand of the situation and instead blame contractors directly on poor quality of works. However, it had tried to compromise and provided assistance on monitoring the projects; still the project had difficulty in controlling since government engineers were not available at site regularly. Of course, it's the responsibility of contractor engineers to be present at all times and control the project, yet the client engineers should also be available as when problems occurred at site but this is not happened in public projects (C5, C18 and C22). As a result it had more frustration between the parties when it had not progress the activities as per plan and required standards of the project.

The conflict evaluated at level 4 is 25.6% frustration. This has experienced when deviations of works had occurred and delayed the project, public owners had not paid the extra items and time compensation. Because of the conflict issue with non-availability of site engineers and supervisors at site had gone perplexed and more complicated when it had involved every context related to defective workmanship and inferior qualities and finishes, coercive attitude of public owners, accidents occurred at site and so on (C5, C9 and C18). Such circumstances at the project had infuriated the public owners and terminated the contract. So, it had experienced high level conflict with 5.2% dispute between the parties. This dispute of very high level of conflict had experienced not only just because of this issue, it had also resulted from other issues related from time, cost, quality and safety in project.

13. Level of Conflict for “Irresponsibility/ Lack of commitment/ attitude & personality problem is conflict issue related to personnel”

The contractors have evaluated this conflict issue and the conflict level is 2.638. This is moderate level of conflict in a situation of antagonism. The detail on conflict distribution on each level can be understood from figure 5.35 given below.

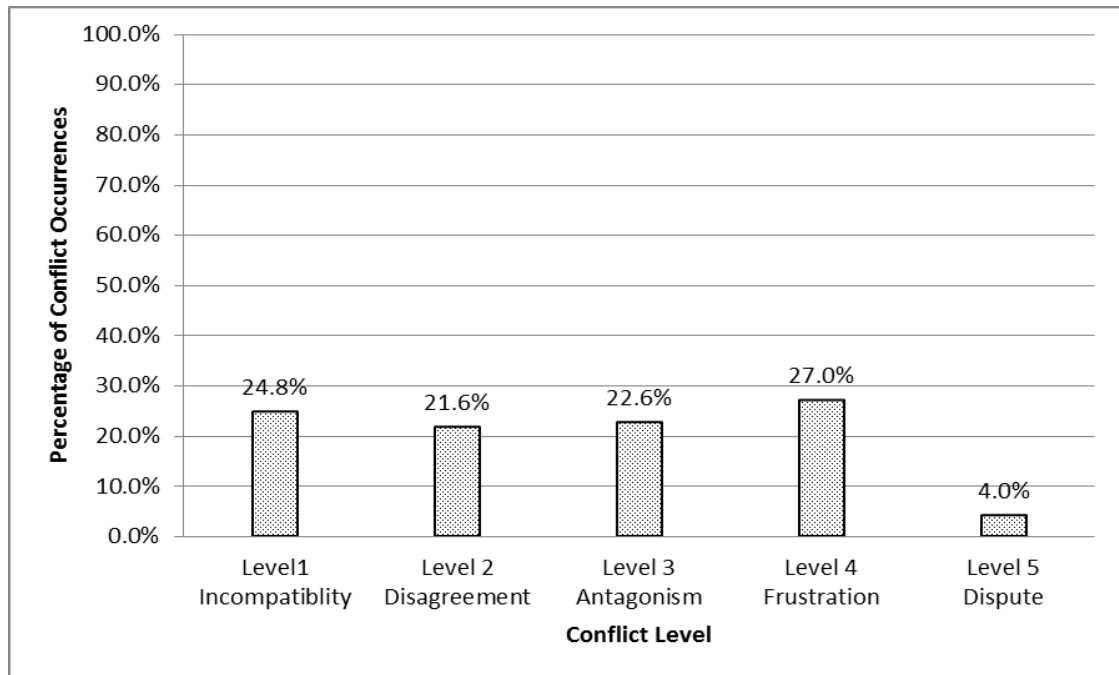


Figure 5.35: Conflict distribution on “Irresponsibility/ Lack of commitment/ attitude & personality problem”

The main reasons behind conflicts related to project goals, objectives and project success are the irresponsibility, lack of commitment, and attitude and personality problem of the concerned persons involved in the construction project (C4, C5, C7, C20 and C22). Right from start of the project, contractor had evaluated 24.8% incompatibilities over the whole construction process since individually worried about another person’s reaction and responsibility of the project because it depends on each other’s good relationship for successful completion of the project (C6, C11 and C19). The root causes of irresponsibility, lack of commitment, and attitude and personality problem were poor working system, weak contract administration systems, no trainings given to specific field of interest, unfair allocation of work load, partiality, no motivation or reward systems, good and competent people had not recognized, lack of clear understanding of service rules, flexibility of the service rules, lack of ethics and moral values, wrong person wrong job, no support from superiors, personal life and background, give less important to engineers and less salaries (C4, C6, C15 and C18). Because of these reasons, most engineers were deprived and became irresponsible, no commitment and as a result the

construction works had just performed by laborers at site. When it has never instructed and verified the works at site, the disagreement between the parties has started (C7, C10 and C24). From the incompatibility between the parties, it had occurred to level 2 with 21.6% disagreement.

The client engineers should be cognizant of ethics and moral values since it had driven with corrupt mind and attitude of conspiracy and nepotism with the contractors. Such thinking in mind has resulted to irresponsibility and favoritism and at the end it affect to project when problems occurs (C1 and C17). However, due to such situations, the project had moved on with disagreements between the parties and sometimes they had tried to understand each other's problem and compromise on the work. Some client engineers had never turn up to site for verification and measurement even at critical point of work activities which had affected the work in terms of quality (C14 and C21). As a result there had breakdown in communication between the parties and lost trust, respect and had lots of perceptual differences (C21). Due to communication problem, it has misinterpreted the drawings and designs, misunderstood change order delays in delivery of critical components to site, failure to execute the instructions and led to more hostile situations (C14 and C21). From experiences of such situation between the parties, the public owner had evaluated 22.6% antagonism at level 3.

The ultimate impact of being irresponsibility of site engineer was the deviations and delayed the payment to contractors. The late information and verification at site was also another impact to project. In addition the poor quality of work and delayed the projects were also due to engineer's irresponsibility and lack of commitment shown (C7cand C15). And when the contractors has not executed the rework, it has frustrated the owner and didn't negotiate on any time and cost that had affected. As a result the conflict had increased at level 4 with 27% frustrations. Moreover public owners reciprocate with the contractors for being irresponsible and not provided the site engineers and supervisors at site as per contract (C2, C5 and C15). Such contradicting issues had never compromise and settled between the parties, as result the project had remained incomplete and violated the terms and

conditions of contract. With the issue of incomplete project, everything had remained incomplete and unable to settle the issue unless it's intervened by third parties (C2 and C15). Likewise, contractor had experienced 4% dispute at level 5. Thus it revealed from contractor's experiences that the breakdown in relationship was the result of breakdown in communication between the parties due to irresponsibility, lack of commitment, attitude and personality problems of each and everyone involved in the public construction projects.

14. Level of conflict for “Poorly developed project planning and scheduling is conflict issue related to time”

The contractors have evaluated this conflict issue and the conflict level obtained is 2.622. This conflict level falls in moderate level of conflict in a situation of antagonism faced during construction time. The conflicts as evaluated by contractor had begun from very low level of conflict with 25.2% incompatibility at level 1 as shown in figure 5.36. The reasons for such occurrences of conflicts are lack of adequate time to prepare proper plan and schedule for the project; engineers are less competent and engaged with more number of projects at a time (C2, C5 and C18). Moreover, it's due to lots of pressures to start the projects before it could do it good planning and scheduling process besides lack of good design and budget processed for the project (C8 and C19). The contractors mentioned that, good project plan and schedule had not run parallel and followed accordingly with the actual activities during construction due to influences from several areas such drawings mistakes, inflations, labor problems, lack of competent project managers, bad weathers, poor communication, management problems, equipment failures etc. (C2, C9, C10, C12 and C22). As a result the contractor had disagreement with contractor when actual activities were lacking behind schedule and started to deviate from plan (PO4 and PO18). The amount of conflict at level 2 has experienced 21% disagreement.

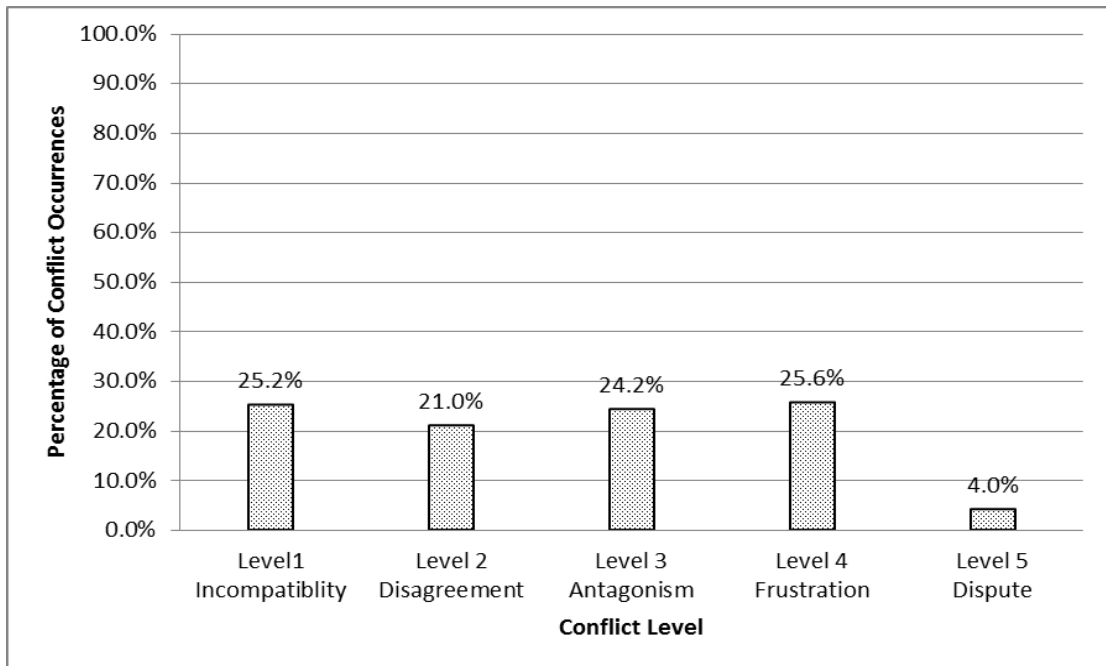


Figure 5.36: Conflict distribution for “Poorly developed project planning and scheduling”

However the contractors had controlled the projects from getting to delay by conducting meeting with public owners and had reviewed the work plan and scheduling process. Even then, the conflicts had escalated to level 3 when it had experienced 24.2% antagonism. Because of unresolved issue, the public owners had faced the situation of bitterness and hatred when it had occurred severe mishaps and deviations in works. The reasons were mainly due to lack of coordination, communication and without proper project control tools shown by contractor and that has raised claims and rights over time during construction phase (C1, C6, C18, C19 and C21). At such situation, contractor (C19) had compromised on the time but public owner had not entertained any claims over time. Therefore the unresolved issue had escalated to level 4 with 25.6% frustration. The contractors were frustrated because it had delayed the project and on top of that the laborers had become non-responsive and had abandoned the project site. The highest conflict experienced by contractors due to this issue was at high level of frustration situation. Although, at some projects the project plans were modified to suit the site conditions and project activities that are on-going (C4). It had also jointly agreed by conducting frequent meeting and

revisited the work plan and accordingly revisions were made (C16 and C21). Yet it had not able to resolve the conflicts fully and escalated further due to poorly developed project planning and scheduling on time. The public owner had imposed penalty at maximum liquidity stage of 10% (C4 and C15). Finally, the public owner had terminated the contract when it had delayed the project uncontrollably. That's why the contractors had evaluated 4% dispute at very high level of conflicts. The public owner had not paid the bill for the completed works also following the termination and contractors were forced to put up the case. Thus it gives direct benefits of understanding why the conflicts has occurred due to poor development of project planning and scheduling. Yet it had also led to high level conflicts due to quality, cost and personality of the people involved in a project. Overall, it concludes that the conflict experienced by contractors while undertaking public projects is at moderate level.

5.5 Discussion Result

5.5.1 Comparison of Perception and Evaluation Results from Public Owners

The levels of conflicts from evaluation in this research are compared with the perceptions on conflict issues by public owners as shown in table 5.7. The table compares the top ten results of evaluation and perceptions on conflict issues. Based on the result of evaluation, the conflict levels from public owners could compare the accuracy of the evaluation scale that was used for this study. To know the accuracy of the evaluation scale, it can be ascertain by comparing against the perceptions result from public owners on particular conflict issues identified. The evaluation results revealed the actual level of conflicts and the situations that are experiencing in public projects during construction phase. For instance the first ranked evaluated results was ranked tenth in perceptions on the same conflict issue by public owners. Likewise, the first rank from public owner's perception was ranked sixth after evaluation. However, the less agreed by public owners based on perceptions has ranked high after actual evaluation.

Table 5.7 Comparative Results of Perception and Evaluation from Public Owners

Public Owner Conflict Issues	Evaluation		Perception	
	Conflict Level	Rank	Mean	Rank
Use of low quality & cheap materials is conflict issue related to quality	3.081	1	3.867	10
Inadequate quality testing facility is conflict issue related to quality	3.035	2	4.067	4
Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality	3.021	3	3.933	7
Poorly develop project planning and scheduling is conflict issue related to time	2.975	4	4.222	2
Frequent change orders causes uncontrolled project schedule is conflict issue related to scope	2.960	5	3.533	23
Slow progress/performance by contractor is conflict issue related to time	2.946	6	4.244	1
Time extension due to design changes is conflict issue related to time	2.929	7	3.644	16
Late payment by client is conflict issue related to cost	2.900	8	3.444	32
An unforeseen underground condition is conflict issue related to scope	2.896	9	3.933	8
Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality	2.871	10	4.044	6

This explains that the perceptions on conflict issues were just based on awareness and opinions only and has not understood the actual level of conflicts and its situations. Thus, the level of perceptions might not have fully represented the conflict levels and effects of conflicts that experienced during construction. However, after the evaluation, the conflict issues from public owners were confirmed in the moderate level of conflicts in a situation of antagonism during construction. This indicates the conflicts level was based on real experiences and practical judgment on the conflict issues that represent the actual effects of conflicts. This was accomplished from the evaluation scale used. Therefore, this conflict evaluation scale found consistent and worthwhile in practical for measuring the actual level of conflicts in evaluation of conflict issues during construction phase.

5.5.2 Comparison of Perception and Evaluation Results from contractors

From table 5.8 also shows the comparative results of perceptions and evaluation results from contractors. The first ranked from contractor's perception on conflict issue had ranked third position after the evaluation. However, the ninth rank from perceptions was ranked first position of conflict level after evaluation. Even the contractor has evaluated for the conflict issue (Frequent change orders causes uncontrolled project schedule is conflict issue related to scope) in moderate level of conflicts (conflict level= 2.800), although it has agreed moderately (mean=3.091) based on their perceptions.

Table 5.8 Comparative Results of Perception and Evaluation from contractors

Contractor Conflict Issues	Evaluation		Perception	
	Conflict Level	Rank	Mean	Rank
Unclear/Incomplete technical specifications is conflict issue related to quality	2.898	1	3.667	9
Late payment by client is conflict issue related to cost	2.893	2	3.697	7
Lack of detail drawing is conflict issue related to quality	2.820	3	4.242	1
Time extension due to design changes is conflict issue related to time	2.809	4	3.545	15
Frequent change orders causes uncontrolled project schedule is conflict issue related to scope	2.800	5	3.091	37
Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality	2.780	6	3.667	10
Slow decision making by client is conflict issue related to time	2.748	7	3.788	3
Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality	2.730	8	3.515	16
Lack of clear information to address the price escalation index is conflict issue related to cost	2.721	9	3.750	5
Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality	2.702	10	3.576	13

This explains that the contractor's perceptions on conflict issues were just based on awareness and opinions only and has not understood the actual level of conflicts and its situations. Thus, the level of perceptions might not have fully represented the conflict levels and effects of conflicts that experienced during construction. However, after the evaluation, the conflict issues from contractors were confirmed in the moderate level of conflicts in a situation of antagonism during construction. This indicates the conflict level was based on real experiences and practical judgment on the conflict issues that represent the actual effects of conflicts. This was accomplished from the evaluation scale used. Therefore, this conflict evaluation scale found consistent and worthwhile in practical for measuring the actual level of conflicts in evaluation of conflict issues contractors during construction phase.

5.5.3 Comparison of Current Research Results with Previous Research

The results of important conflict issues from perceptions of this research are also compared with the conflict factors mapped from previous studies as in table 5.8. The table compares the top five conflict issues of the current research and factors of the previous studies. The previous study shows that the delay in payments factor was the first position from the perceptions of Tanzanian study (Stanslaus, 2011) and fourth position in Malaysian study (Tajul, 2010). The factors of conflict are in general view and did not specify the main conflict issue. For example, the contractual claims are the factor of conflict but it has not specified the conflict on type and level of conflict. The contractual claim could be the conflict issue related to project time and cost since these are the main issues of conflicts during construction (Fenn and Gameson, 1991). From Korean study, the conflict factors such as double meaning in specification and excessive quantity of works was their first and second ranked results (Acharya, 2006). On the other hand, people perceptions and project goals and objectives was the topmost ranked from the study of conflicts in Saudi Arabia (Sediary, 1994). The communication breakdown, administrative procedures and absence of team spirit among the project participants are also the topmost factors of conflicts from the study of Hongkong and Malaysia construction industry. All these studies have focused on

identification of causes and factors and have not focused on specific conflict issues. And also it does not represent clear categories of factors and areas of conflicts. This means that there are chances of misleading the conflicts issues and factors might be just perceived as the problems rather conflict. It is observed that the mean values of conflict factors quite low compare to mean values of conflict issues.

In brief, this illustrates that the perceptions on factors of conflict were just based on awareness and opinions only and has not understood the actual conflict issues. In addition, the previous study on identification of factors might have difficult to recognize the real reasons for conflict without understanding the conflict issue. As a result it might have difficult to understand the conflicts and hard to proceed with evaluation process without understanding the conflict issue. Thus, the level of perceptions on factors alone might not have realistic and fully represented for evaluating conflict levels and effects of conflict. This important conflict issues gave more meaningful to represent in evaluating level of conflicts. After the evaluation, the conflict issues from public owners and contractors were confirmed in the moderate level of conflicts in a situation of antagonism during construction. This indicates the conflicts level was assessed based on actual experiences and practical judgment on the conflict issues that represent the actual effects of conflicts. This would not have achieved if it had just focused on factors and causes of conflicts as in previous studies. However, this was accomplished from the evaluation scale used. Therefore, this conflict evaluation scale found consistent and worthwhile in practical for measuring the level of conflicts in evaluation of conflict issues between public owners and contractors during construction phase.

Table 5.9 Comparison of Current Research Results with Previous Research

Current Research		Previous Research				
Perception	Evaluation	(Stanslaus, 2011) Tanzania	(Acharya, 2006) Korea	(Sedairy, 1994) Saudi Arabia	(Leung, 2001) Hongkong	(Tajul, 2010) Malaysia
(1) Slow progress/performance by contractor is important conflict issue related to project time (4.244)	Use of low quality & cheap materials is conflict issue related to quality (Conflict Level=3.081)	(1) Delay in payments (4.19)	(1) Double meaning in specification (2.39)	(1) People's perception	(5) Communication breakdown	(1) The absence of "team spirit" among the participants
Lack of detail drawing is important conflict issue related to project quality (4.242)	Inadequate quality testing facility is conflict issue related to quality (Conflict Level=3.035)	(2) Contractual Claims (3.76)	(2) Excessive quantity of works (2.38)	(2) Project goals and objectives	(2) Administrative procedures	(2) Contract clauses, which unrealistically and unfairly shift projects risks to parties who are not prepared or not able to assume such risk
(2) Poorly develop project planning and scheduling is important conflict issue related to project time (4.222)	Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality (Conflict Level=3.021)	(3) Excessive contract variations (3.03)	(3) Errors and omission in design (2.31)	(3) Cultural difference or orientation	(3) Scheduling and sequencing of work	(3) Poor communications between and among the parties involved in the project
(3) Unclear/Incomplete technical specifications are important conflict issue related to project quality (4.067)	Poorly develop project planning and scheduling is conflict issue related to time (Conflict Level=2.975)	(4) Difference in evaluation (2.88)	(4) Difference in change order evaluation (2.22)	(4) Understanding level	(4) Cost estimates	(4) Disputes over payment
(4) Inadequate quality testing facility is important conflict issue related to project quality (4.067)	Frequent change orders causes uncontrolled project schedule is conflict issue related to scope (Conflict Level=2.960)	(5) Poor communication (2.77)	(2) Local people obstruction (2.07)	(5) Project priorities	(5) Unrealistic expectations	(5) Reluctance on the part of project participants to deal promptly with the changes and unexpected conditions

5.5.4 Box and Whisker Plots for Various Conflict Levels

The box and whisker plots are helpful in graphical display for summarizing the distribution of data sets (Becktti and Cohen, 2006). It can compare the distributions of data range at glance and help us to know the center, variations, skew and overall range. Likewise, this box plots is used for this study to summarize the distribution of conflict occurrences at different conflict levels.

(a) Box and Whisker Plots for Conflict Levels evaluated by Public Owner

Figure 37 displays the box-and-whisker plot of conflict occurrence on five conflict levels indicating five number summaries such as minimum, lower quartile, median, upper quartile and maximum. The middle line in the box depicts the median which is more representative of the central tendency and controls the impact of outliers. When the conflict level was analyzed by looking at the median value, different trends can be observed.

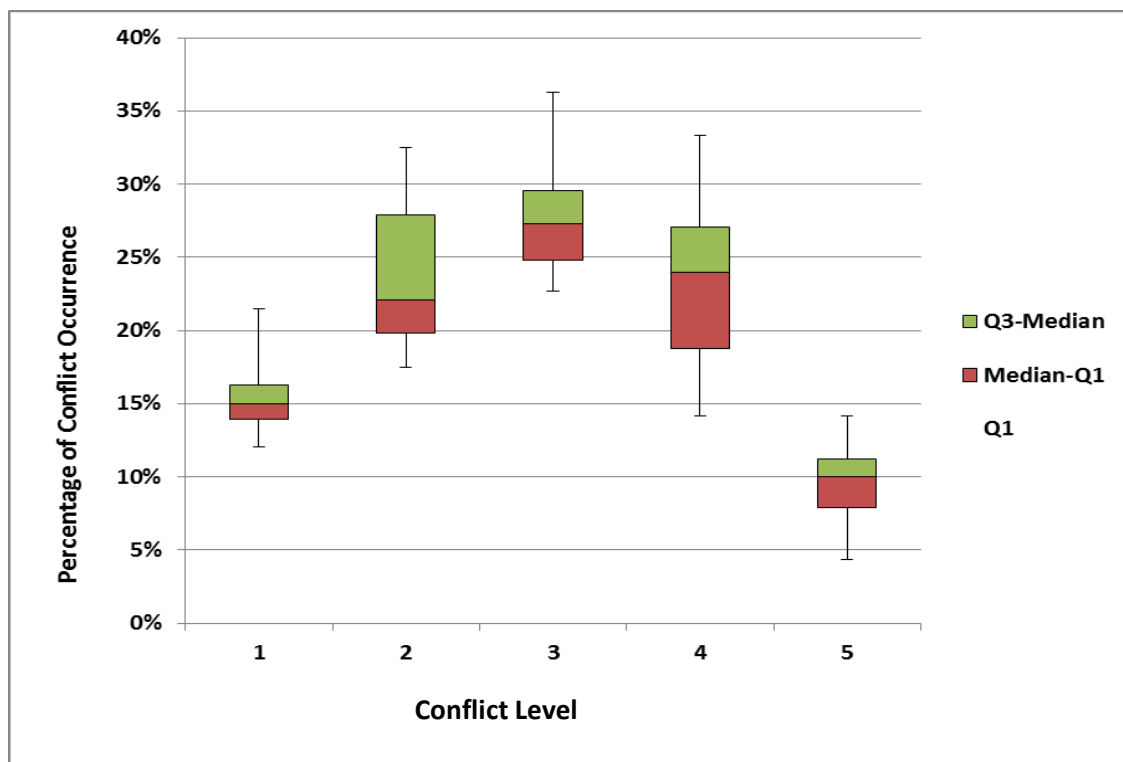


Figure 37: Box-and-Whisker plot from Public Owner

Based on the box and whisker plot of conflict levels evaluated by public owners, the position of box is high for level 3 than others. It can be observed that the minimum value of the data ranges for conflict level 3 lies at 22.7%. The first quartile or the 25th percentile of the data occurs between 22.7% to 27.3% and the median of the data range of level 3 lies at 24.8%. However the maximum value of the data range or the third quartile or 75th percentile or the median of the upper half has occurred at 36.3%. This is the maximum value of the data range for conflict level 3 comparing to other conflict levels. Next high position of box and longer whisker length is at level 4. This shows that the maximum trends of data are skewed inside the box and moreover the length of box and whiskers are longer than level 2. It observed that the maximum value of the data range at 75th percentile is 33.3% for level 4 and 32.5% for level 2. Although the level 3 (27.9%) has little higher value of range at 75th percentile than level 4(27.1%), the median of the data range of level 4 (24%) is more than that of level 2 (22.1%). Comparing the box and whisker plots, the position and length of the boxes and whiskers for level 5 is at lower occurrences. This visualizes the data range are less skewed for these two levels and contribute less conflicts in overall assessment. However, the conflicts due to level 5 can be high but the occurrences are relatively less. The minimum value of the data range has occurred at 4.4% and maximum value is at 14.2%.

(b) Box and Whisker Plots for Conflict Levels evaluated by Contractor

From figure 38, based on the box and whisker plot of conflict levels evaluated by contractors the position of box is quite high for level 4 than others. It can be observed that the minimum value of the data ranges for conflict level 4 lies at 25.4%. The first quartile or the 25th percentile of the data occurred at 27% and the median of the data range of level 4 lies at 27.8%. However the maximum value of the data range or the third quartile or 75th percentile has occurred at 29.8%. This is the maximum value (33.4%) of the data range for conflict level 4 comparing to other conflict levels. Next high position of box and longer whisker length is at level 3. It observed that the maximum value of the data range had occurred at 29.6% and 25.1% at 75th percentile for level 3. At level 1, it has longer box length but the whisker length towards

maximum value is shorter which indicates the ranges of data are less and the whisker length is longer towards minimum value ranges. This indicates that the effects of conflict are at minimum values. It observed that the box at level 2 is relatively small but the whisker length is longer towards maximum value range of data. This shows that the range of data is likely higher and the maximum value has occurred at 26.4%. On the other hand, the box position of level 5 is at lowest occurrences and the distance between first quartile and median is very small and the minimum value of data range is 2.8%. Yet the distance between median and third quartile is more and the maximum value of data range has occurred at 9.4%.

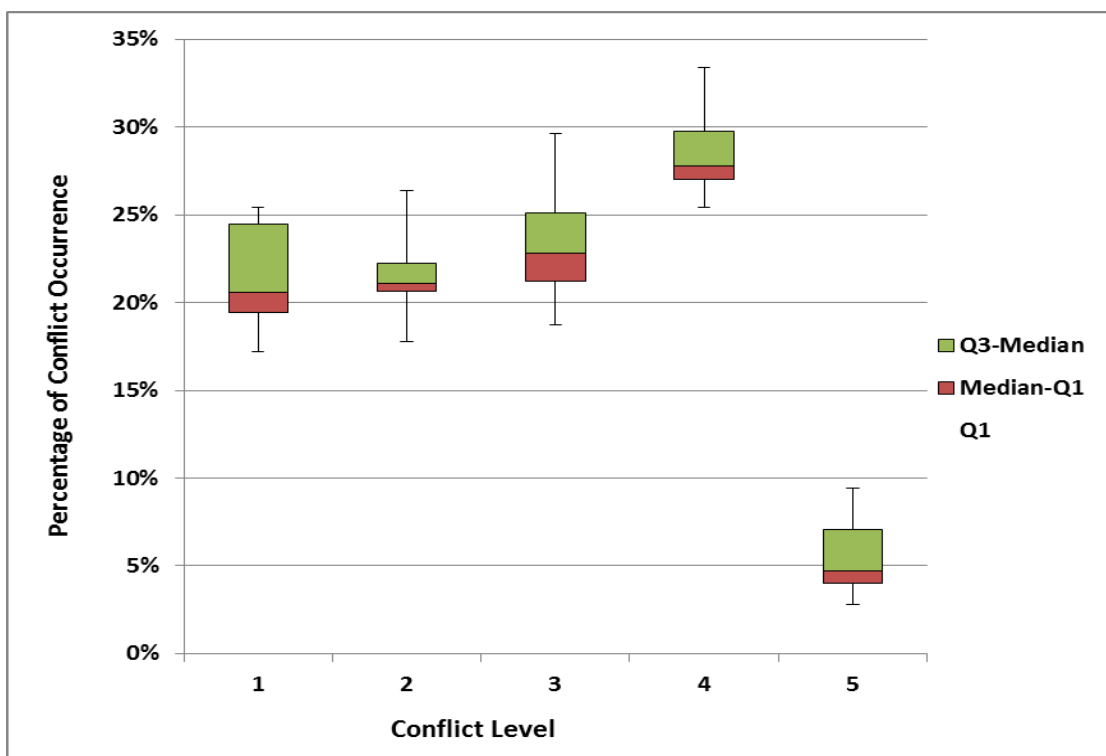


Figure 38: Box-and-Whisker plot from Contractor

In conclusion, the box and whisker plot from public owners and contractors presented the overview of the distribution of conflict occurrences at different levels. In both cases, the maximum occurrence of conflicts was observed at level 3 and level 4. However, it has also followed by level 2 to have likely high trend of conflict occurrences. This graphical result summarizes that the conflicts are concentrated more at level 3 in overall range of data distribution. The result has complemented with the

evaluated conflict level in a situation of antagonism between parties during construction. In addition, it represented the graphical scenario that connects the evaluation results and gives better understanding of conflicts that has experienced in public projects. Thus, this graphical representation gives more insight to evaluation result and established the constancy, practicality and confidence of the evaluation scale used for this study.

5.6 Summary

This chapter focused on evaluating level of conflicts in public projects from public owners and contractors. First it focused on description of survey data and explained about respondent's profile. Then the evaluated data were checked for accuracy and completeness to ensure suitable for analysis. Second, it described about the analysis and computation of level of conflicts from raw data. Third, the conflict issues were explained based on distribution of conflicts at various levels against its occurrences from the evaluation results of public owners and contractors. The explanations were supplemented by respondent's actual field experiences and comments maintained during the survey. From the results of public owner's evaluation, the critical conflict issues were related to quality and time whereas the critical conflict issues from contractor's evaluation were related to project quality and cost. All of the conflict issues were found to be in a moderate level of conflict which occurred in a situation of antagonisms between the parties due to severe mishaps and deviations in works. The consequences were issues of raising claims, hindrances and rights over time, cost, quality, safety, scope, personnel and others during construction phase that has further led to delays, non-responsive, abandonment of site, suspension or stoppages/termination etc. Lastly, it discussed about the results from perceptions and evaluation to see the constancy of the evaluation scale used. Further, the result of this study was also compared with the previous study. Thus, the evaluation scale was found useful and it gives benefit to understand why conflicts have occurred and on which conflict issues are dominant in public projects.

CHAPTER VI

ANALYSIS OF ROOT CAUSES AND SOLUTIONS TO REDUCE CONFLICTS DURING CONSTRUCTION

This chapter focuses on the analysis of root causes and appropriate solutions to reduce conflicts during construction in public projects. First it focuses on the qualitative analysis of interview results interpretation and then focuses on analysis of root causes and solutions for critical conflict issues that were collected from public owners during survey. Then, it focuses on the recommendations with appropriate solutions and strategies for reducing the conflicts during construction of public projects. This chapter mainly attempts to give suggestions and recommendations on what approaches and directions are required to reduce conflicts by concerned project participants and controlling agencies of any public projects.

6.1 Qualitative Analysis of Interview Results and Interpretation

This section describes about the qualitative data collected from the interview of 12 respondents. It is imperative to highlight that all information gathered during survey are analyzed based on respondent's opinion. It also revealed the results of qualitative data from interrogating public owners in Bhutanese public construction projects. The result consists of analysis of root causes and solutions to reduce conflicts for 10 critical issues of conflicts between the parties during construction phase. The descriptions of analysis on each critical issue are presented in the next section. These 10 critical issues were obtained from the result of evaluated level of conflicts in chapter 5.

The aspiring respondents were asked about their opinions and experiences regarding each of those 10 critical issues. Basically, the description of the interviewee's opinions and experiences were explained on three points. The first point was "what are the root causes of critical conflict issues"? This inquiry was basically to discover the main objectives and reasons of the conflict issues during construction of public projects. The second inquiry was "what are the current practices when conflicts

occurred during construction”? Third point was “what strategies or solutions would be appropriate to reduce such conflicts during construction phase”? This was to better understand and gain explicit knowledge in the research findings. Understanding the current practices to resolve conflicts from public owner’s standpoint are very crucial to distinguish the conflict situation and then to apply appropriate solutions. Therefore, in order to effectively manage conflicts during construction, first need to understand the issues, and then identify root causes of its specific issues so that appropriate solutions can be apply to reduce such conflicts on time.

6.2 Root Causes and Solutions for 10 Critical Conflict Issues

1. Root Causes and Solutions for “Use of low quality and a cheap material is a conflict issue related to quality”

The root causes of conflict on quality issue due to use of low quality and cheap materials during construction of public projects are categorized in four themes as shown in figure 6.1. First theme is the non-availability of construction materials. All construction materials are not available in the country and that have resulted to bountiful procurement of low quality and cheap materials which are mostly available in the neighboring border towns of India. The second theme is the lack of awareness on importance of quality of work had resulted to use of low quality and cheap materials. The reasons are contractors and public owners gave less importance to quality without concerning the long term benefits. Moreover, they are less concerned about the risk and future safety of the structure when used with low quality materials. The suppliers have also less knowledge on the quality of materials as they have imported from outside country. The third theme is the contractor’s motive towards the project. Of course the contractors entered into construction business venture to make money out of it but usually most contractors intentionally procured cheap and low quality materials as their main motive is only on profits. In addition, contractors were not able to buy good quality of materials because of the abnormally low quoted rates while tendering for a project when they have attempted to win the project.

The last theme is the inadequate material control system due to the lack of quality testing facilities and resulted to use of low quality materials during construction. The public owners usually check the materials at site based on judgment and visual inspection without any quality checking tools and equipment. Moreover it's also due to negligence by the client to check the quality of materials before it used in construction works.

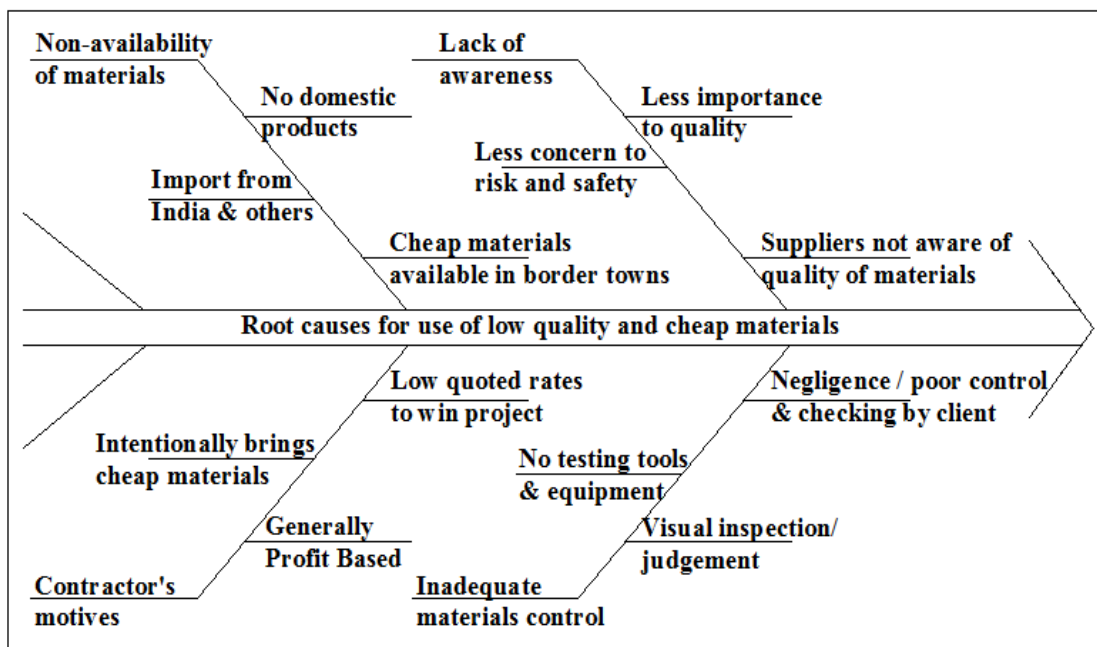


Figure 6.1: Cause of using low quality and cheap materials

Solutions

In order to reduce conflicts during construction due to use of low quality and cheap materials, the public owners **should have** proper checking and control of the materials brought at site before being used (PO1 and PO9). The checking and testing of construction materials has to be made mandatory for public projects. The contractors should also procure materials as per the Bhutan quality standards and guidelines. In addition, the government should educate contractors on quality and create awareness on long term benefits of quality and risk of structural failure due to inferior quality of works (PO1, PO5 and PO9).

2. Root Causes and Solutions for “Inadequate quality testing facility is conflict issue related to quality”

The main causes of conflict with quality issue due to inadequate quality testing facilities are framed into four themes as shown in figure 6.2 below.

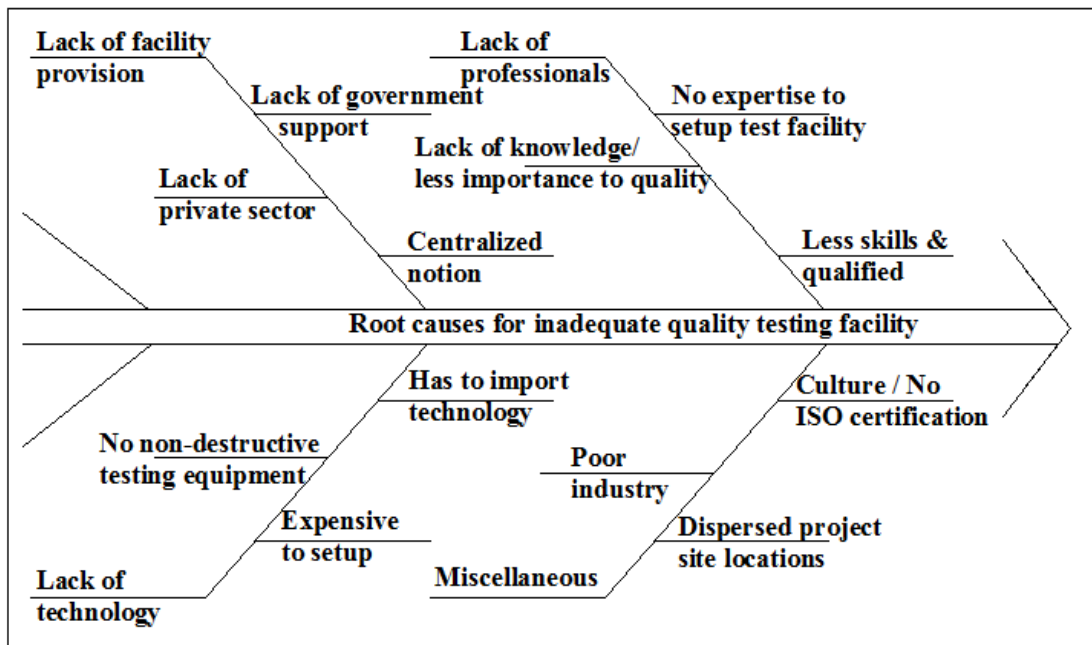


Figure 6.2: Cause of inadequate quality testing facility

First theme is the lack of facility provision that result into inadequate quality testing facility in the country. The reasons are due to centralized notion of having only one testing center, lack of support from government to set up enough facilities and no private sector involvement in running the quality testing facility. The second theme is the lack of technology in a landlocked country. Because of this, there are difficulties to set up adequate testing facilities without sufficient budget in a growing construction industry where there are no apparatus and non-destructive testing equipment. All the equipment and machines has to import from other countries to set up such quality testing facilities. The third theme is lack of professionals in the industry. There is no expertise to set up and run the quality testing facility in the country as the technical people have less skills and qualification in this specific field. In the miscellaneous theme, the quality testing facilities were difficult to setup as the project sites are

mostly dispersed and most construction practitioners are not habituated to quality of work and has relied on to old system of work verification and acceptance. Yet there are no encouragement and improvement in work quality up-gradation through recognition of some standards and practices such as ISO certification etc.

Solutions

The conflicts due to this conflict issue may reduce by giving importance on quality of works and emphasizing testing the quality. Therefore, more quality testing facilities in the country can be established by government or through encouragement of private sector involvement (PO1, PO9 and PO12). However, in the absence of adequate quality testing facilities, the contractors are encouraged to have mobile testing equipment at construction site. And also it emphasizes to have good workmanship based on standard practices, operation procedures and strictly follow QAP/QAS in absence of more number of testing facilities. It is also recommended to make best use of testing facility that is only available in the country (PO5 and PO11).

3. Root Causes and Solutions for “Inadequate supervision, regular inspection or verification on construction site by client engineer is conflict issue related to quality”

The root causes for this issue also framed into four themes as shown in figure 6.3. The first theme is the inadequate human resource such as shortages of competent engineers and experiences in the construction field. The reasons for inadequate supervision or regular inspection on construction site by client engineers are also due to lack of motivation, encouragement or any recognition and incentives scheme for engineers. The second theme is the inadequate knowledge on the construction process and management. The reasons are due to lack of short term trainings to engineers in collaboration to technical institutes and research centers. The other reason for engineers being irregular and inadequate supervision on construction site is also due to absence of clear rules that can impose risks and liabilities. The third theme is the difficulty of site management by client engineers when there are too many sites at a

time in dispersed locations. It had also faced difficulty in management when there are slow work performance by contractors despite its follow-ups and reminders which lead to inadequate supervision and verification at site. In the last miscellaneous section are supported by causes such as transportation and communication problems are the reasons for not able to do timely supervision and control the quality of works. It had also depended on the personality and lack of commitment of the engineers for the project that caused inadequate supervision, regular inspection or verification on construction site.

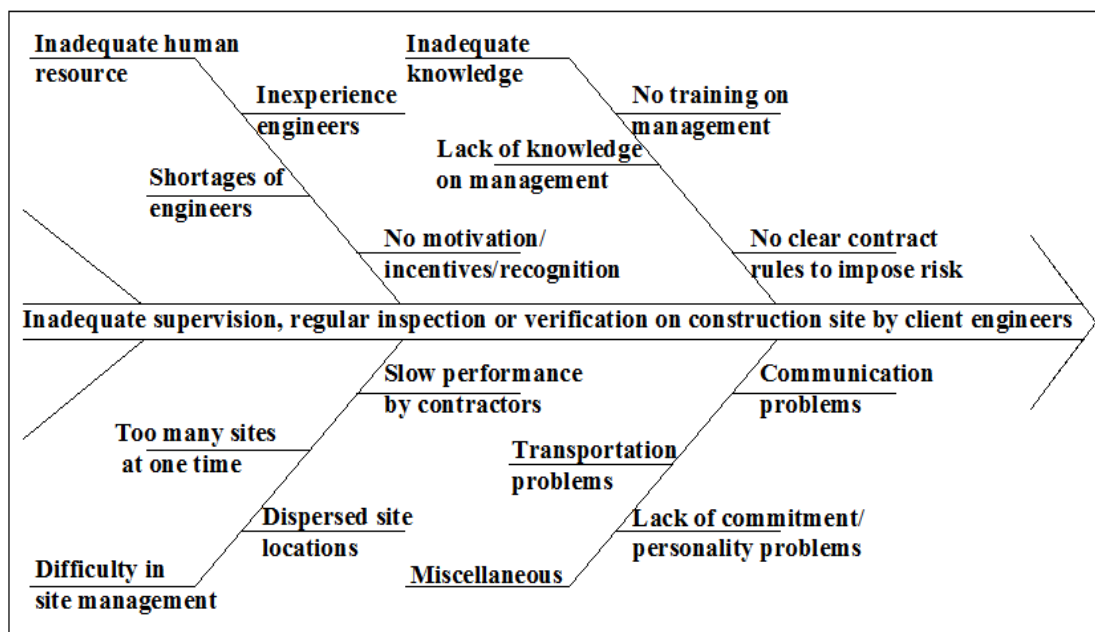


Figure 6.3: Cause of inadequate supervision, regular inspection or verification on construction site by client engineer

Solutions

The number of client engineers and technical manpower has to be increased in public department (PO1). The responsible client engineers can coordinate meeting with contractors, supervisors and workers and brief them on the status, update and keep track of the progress and inspect work sites before commencing any activities and maintain proper records to refrain from any liabilities. The government also should give equal opportunities & training, motivation & benefits, retain and upgrade

competent and capable persons, motivation and training skills and management, increase salaries and recognize the engineer's job (PO1, PO3, PO5 and PO9).

4. Root Causes and Solutions for “Poorly develop project planning and scheduling is conflict issue related to time”

The root causes for poorly develop project planning and scheduling related to project time are grouped into four themes as shown in figure 6.4. The first theme is the resource limitation such as lack of expertise, limited project time and inexperience and incompetent engineers. Second theme is the poor technical knowledge due to lack of training on project plan and scheduling and update on knowledge on construction management software. Third theme are the interruptions and influences which lead to poor development of planning and scheduling due to changes during construction by public interruption and influences from top management. Last in the miscellaneous theme are due to pressure of budget lapses, urgency of work involved with social events and coming of adhoc or unplanned activities had caused poor development of project plan and scheduling.

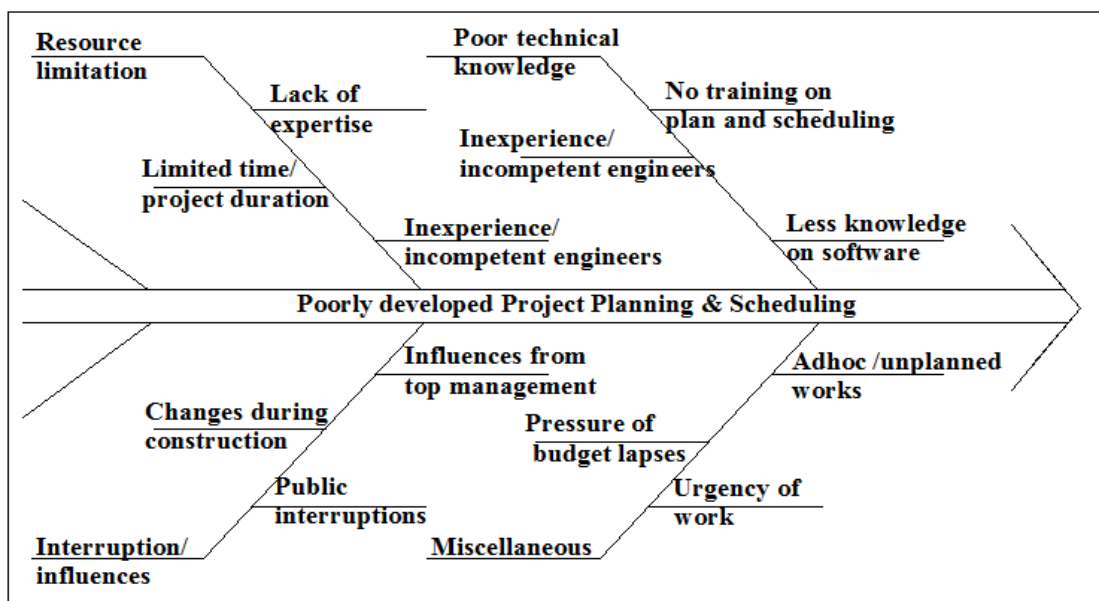


Figure 6.4: Causes of poorly develop project planning and scheduling

Solutions

To reduce conflicts during construction, there should have good project planning and management practices. The public owner has to provide adequate time for planning, design and scheduling. In addition, there should have competent engineers at site to prepare and update the project plan and schedule according to the work progress. From both the parties, there should have continuous monitoring or regular site visits for rectification and suggestions. The client engineers and contractor's engineers should be given training on project planning and scheduling relating with software program (MS project or Primavera).

5. Root Causes and Solutions for “Frequent change orders caused uncontrollable project schedule is a conflict issue related to scope”

The root causes of conflict due to this issue are grouped into four themes as shown in figure 6.5. First is the poor planning and design that caused frequent change orders due to improper design and errors, unrealistic local area plan or site map which had prepared without comprehensive study and site appraisal report. Second is the poor project plan and scheduling prepared by inexperienced or incompetent engineers in a limited time without any project management software had caused frequent change orders leading to uncontrolled project schedule and change of scope of work. Third theme is the influences and interruptions that had caused frequent change orders due to changes by superiors, public interruptions, stakeholders or regulars during course of construction. In the miscellaneous theme, the change orders had caused by site conditions, nature of soil and unforeseen underground conditions. In addition it had also caused due to poor workmanship and poor quality of works done at site. The shortage of fund and lapses of budget had also caused changes to scope of work and shifting of schedule uncontrollably.

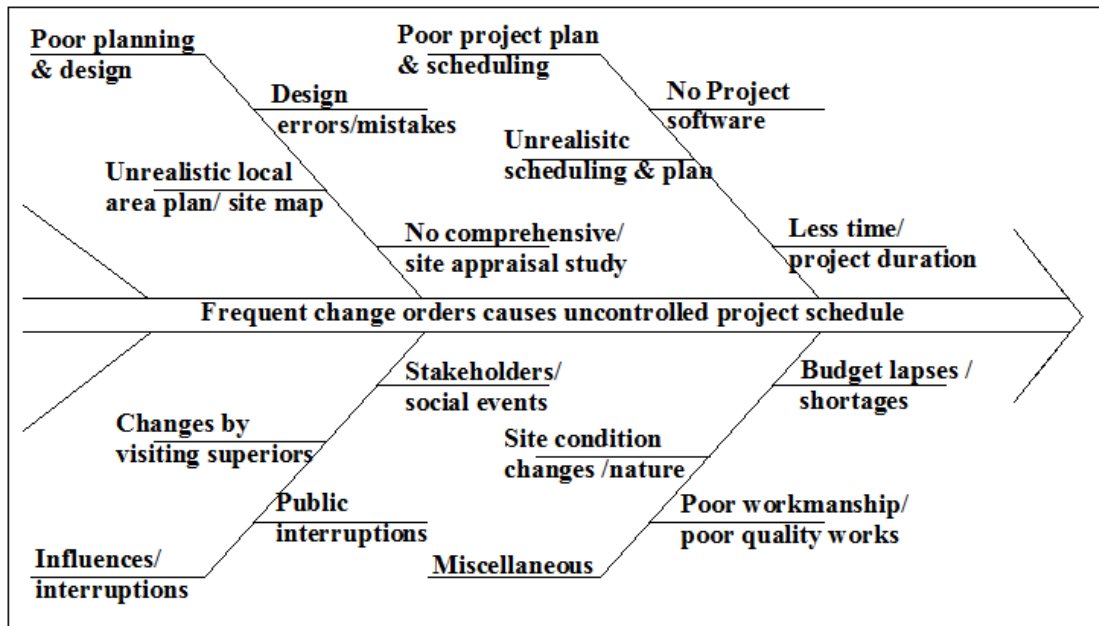


Figure 6.5: Cause of frequent change orders caused uncontrollable project schedule

Solutions

The public owners should emphasize on preparation of detail project planning and discuss the scope of works with all the relevant stakeholders to minimize the changes during construction. The detail design and estimation for specific project has to be carried out by experienced and competent client engineers. In addition, the coordination meeting among the concerned designers, architects, engineers and surveyors has to be done during design phase to discuss the project natures and impacts of changes and liabilities.

6. Root Causes and Solutions for “Slow progress/performance by contractor is conflict issue related to project time”

The root causes for slow progress or performance by contractors related to project time issue are also framed into four themes as shown in figure 6.6. The first theme is the resource limitations which includes the contractor’s inability to mobilize resources such as financial, manpower and machines has led to slow work progress.

The shortage of labor and equipment, non-availability of supervisors and engineers and inadequate project duration are also the reasons for slow progress or performance by contractors. The second theme is the poor site management by contractors such irregular monitoring and updating the progress, poor financial management and budget control system. In addition, the contractors start the project very late from the actual commencement date without project plan and scheduling. Third theme is client's influence on the project such as late payment of bills, frequent change orders and late approval of changes and permits that has slowed the work progress. In the miscellaneous theme, the slow progresses are due to too many works taken by contractors at a time, caused by natural calamities and unreasonable hindrances. Among this one main reason of slow progress is contractor's inability to understand and correctly price the works which made bankruptcy and delayed the project.

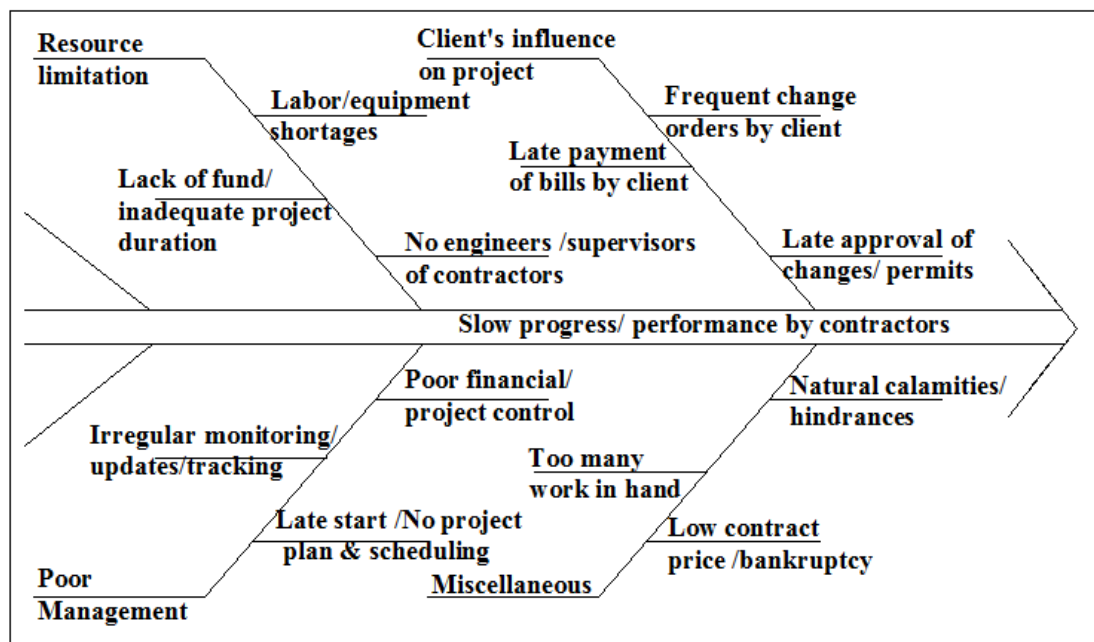


Figure 6.6: Cause of slow progress/performance by contractors

Solutions

The contractors are suggested to prepare adequate work plan and scheduling, budget expenditure, resource allocation plan, labor management and cost control systems. Importantly, the contractors should properly understand the project nature

and correctly bid the work. The public owners should ensure contractors to have required skill manpower, technical and financial capacity. However, the public owners has provide timely payment of bills, less changes, reasonable compensation on time and strict supervision right from the project starts (PO1 and PO9).

7. Root Causes and Solutions for “Time extension due to design changes is conflict issue related to time”

The root causes for time extension due to design changes are explained in four themes as shown in figure 6.7 below. First is the design mistakes caused design changes requiring time extension due to less importance given for design in limited time frame for planning and design phase. Moreover the design mistakes are caused by inexperience designer.

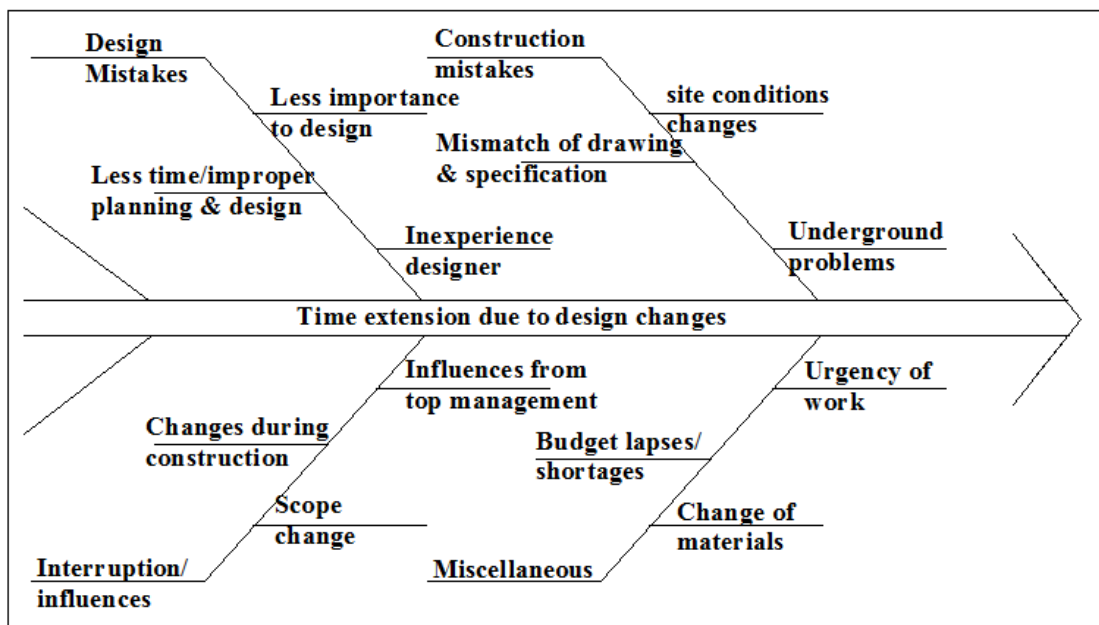


Figure 6.7: Cause of time extension due to design changes

Second theme is the construction mistakes that had caused design changes due to mismatch of drawings with specification, site condition changes and unforeseen underground conditions. Third are the interruptions and influences from top management and external influences during construction which caused changes in

design and scope of works. Fourth in the miscellaneous theme the design changes are caused due to budget lapses resulting to change in scope of works. In addition, the design changes were caused by change of materials in work and urgency of work involved requiring changes in design and time extension.

Solutions

The public owners should give more importance to design and planning phase with adequate time and cost rather than experiencing conflicts during construction phase (PO1, PO7 and PO9). The designers are also encouraged to conduct the site appraisal for the particular project before starting with the design works. Once the design is complete, it should be made final and shouldn't be change unless it is technically essential due to unforeseen site conditions (PO4 and PO8). In addition, the proper clauses in the contract should be provided to compensate time extension caused due to design changes during course of construction time (PO1, PO8 and PO12).

8. Root Cause and Solutions for “Late payment by client is conflict issue related to cost”

The root causes for late payment by client issue are grouped into four themes as shown in figure 6.8 below. The first theme is the budget constraints in project due to inadequate allocation of budget for project, late release and shortages caused late payment by client. Second theme is the inadequate payment system practices such tedious process entering bill into measurement book, late submission of bill by contractors and slow evaluation and pass by accountants. Third is the error in evaluation and quantity measurement due to irresponsibility and negligence by engineers, false measurement without combined or joint measurement by client engineers and contractors had caused late payment. Fourth in the miscellaneous theme, the late payment by client are caused by rejecting the poor quality of works done at site, no penalty provision for late payment and also due to improper terms and conditions for payment in contract.

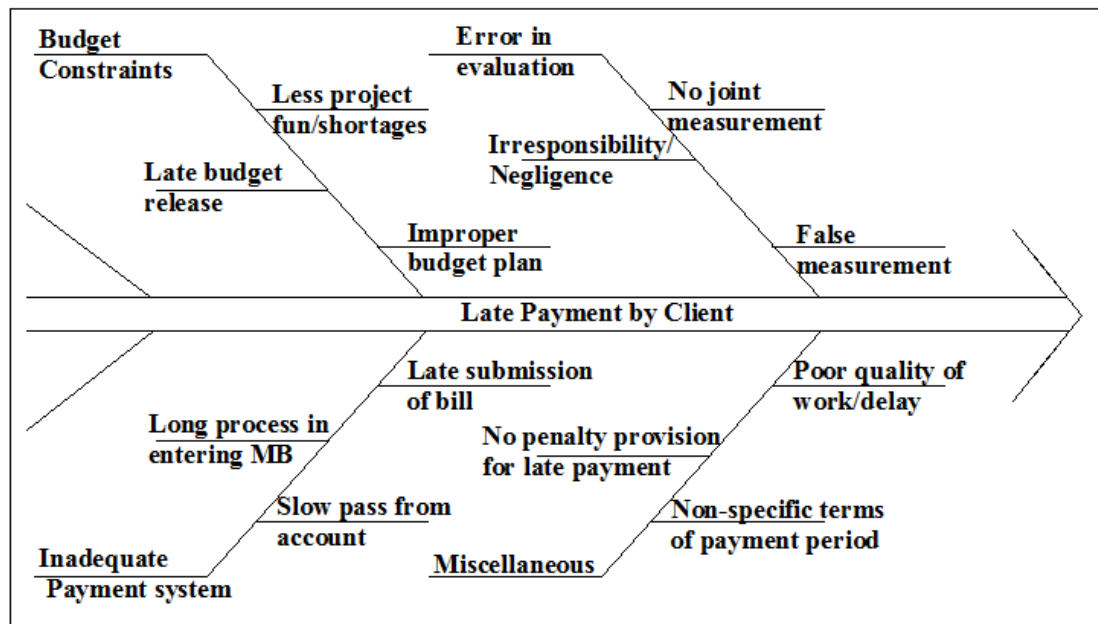


Figure 6.8: Cause of late payment by client

Solutions

The public owner can revisit and revise timely payment clause and penalty and enhance existing payment system. There should have good payment management system and financial planning for particular project by public owners. The public owner should also ensure adequate allotment of budget and timely release from the budget sources of Ministry of Finance and donor aid agencies. The public department can allow the bill measurement entry and record in spreadsheet to have faster service and error free instead of tedious process of entering in measurement book (MB).

9. Root Causes and Solutions for “Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality”

The root causes for this issue are grouped into four themes as shown in figure 6.9. First theme is the lack of knowledge on quality control and assurance processes by parties. Second theme is the no quality control programs are reflected in contract. Moreover the engineers are incompetent to prepare quality control/assurance system and QAP are not followed and inspect the quality of work. In the third theme is the

less importance given on quality due to complacency of government engineers, too many works at time and contractor's motive on profit based. Fourth in the miscellaneous theme are due to no ISO certified contractors, less risk and liability for poor quality of works and also due to less technology and testing facilities in the region.

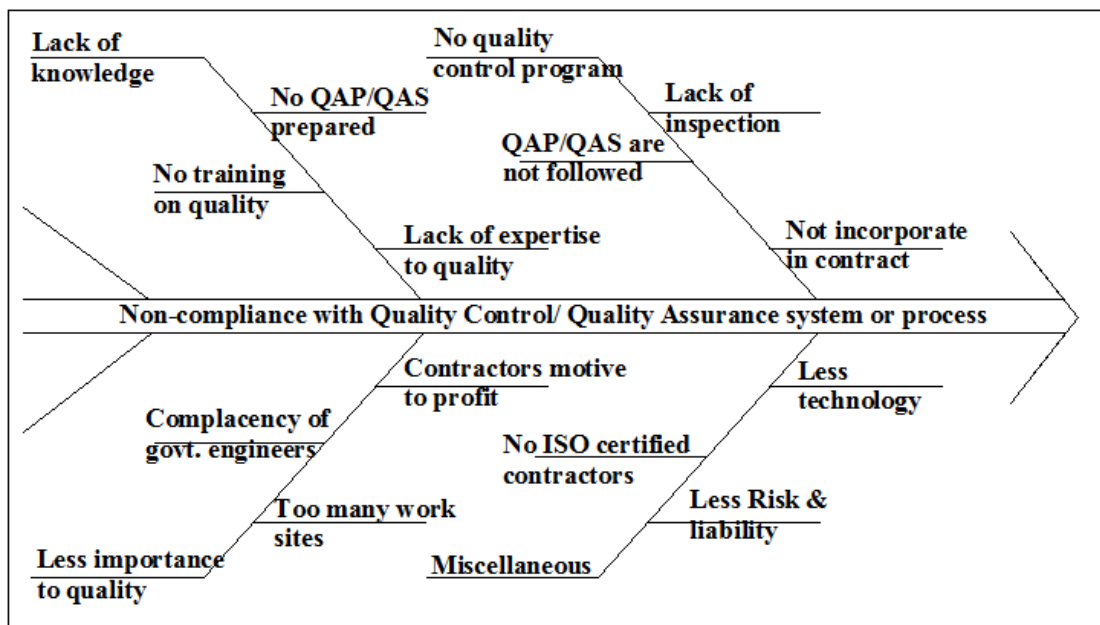


Figure 6.9: Cause of non-compliance with quality control/quality assurance system or process

Solutions

In order to reduce conflicts during construction, the quality inspection and quality assurance has to be enhanced and made mandatory. The contractor should be encourage preparing QAP/QAS before start of project and should be approved by public owners. During construction, contractor should produce approved construction plan and operational procedures. The public owners can check the work done against QAP and make system of preparing daily work done report by supervisors (PO1, PO3, PO8 and P12).

10. Root Causes and Solutions for “Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality”

The root causes for poor workmanship or rework due to non-compliance with methods and good practices are classified into four themes as shown in Figure 6.10.

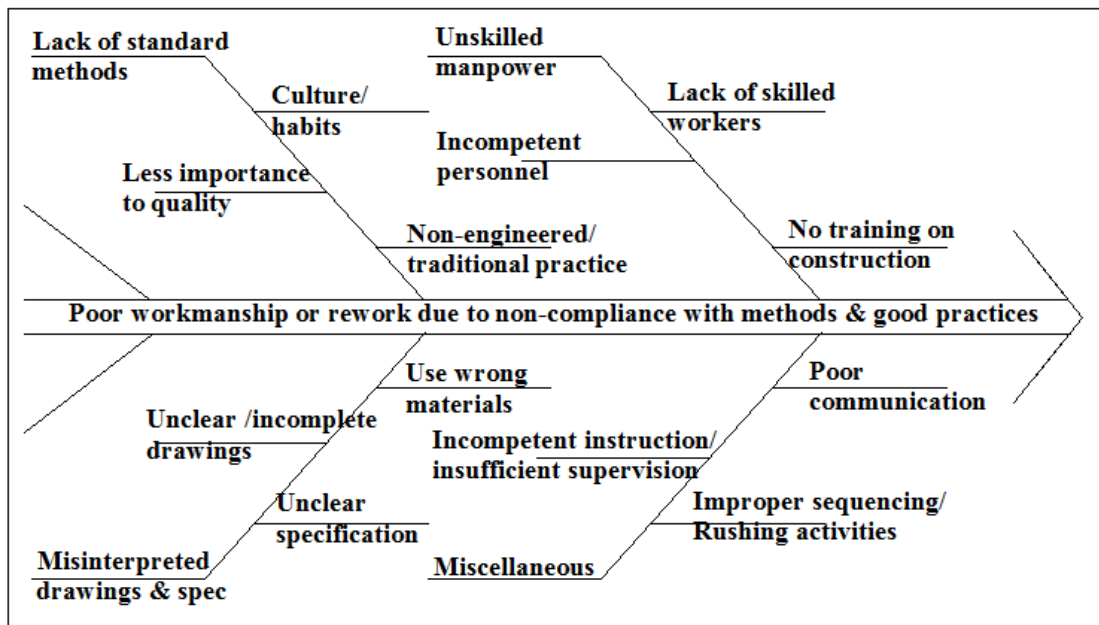


Figure 6.2: Cause of poor workmanship or rework due to non-compliance with methods and good practices

First theme is the lack of standard methods and practices to perform good workmanship which is still practice with traditional methods and lacked good quality control commitment. Second theme is the unskilled manpower with incompetent personnel, unskilled workers and lack of training on quality had caused the poor quality construction. Third theme is the misinterpretation of drawings and specifications due to unclear or incomplete drawings and specification and use of wrong materials that cause rework and poor workmanship. And in the fourth miscellaneous theme are due to insufficient and incompetent supervision, improper work sequencing, improper work protection and safety issues, lack of coordination and meetings, poor communication between field inspectors and constructors had caused poor workmanship and rework.

Solutions

To reduce conflicts during construction with this conflict issue, the public owners and government should set engineering and construction standards to be followed during construction to minimize reworks and improve quality of works (PO1, PO5 and PO12). The construction industry can focus on prefabrication and industrialized building system from traditional construction practices to improve work efficiency and workmanship. It's high time to shift from traditional practices to mechanization witnessing the shortages of workforce, slow performance, modernization, nature, disasters such as earthquakes etc. (PO1 and PO7). In addition, the engineers, technicians, masons and carpenters are needed to be certified by board to permit as skilled manpower in construction. The construction methods and practices are needed to be improved and enhance through training and awareness program on quality assurances and innovation methods (PO1 and PO11).

6.3 Recommendations and Solutions to Reduce Conflicts in Public Projects

Stanslaus (2011); Sedairy (1994); Carmicheal (2002); Hall (2000); Campbell (1997) and Lowe et al., (1997) has revealed from their studies that the causes of conflicts during construction are mainly between the public owners and contractors since they are major the role players. Finally, this study also exposed that most conflicts are experienced between the public owners and contractors during construction of public projects as envisaged.

The nature of the level of conflicts in public projects has originated with problems and developed into difference of opinions, incompatibility which had simply escalated to disagreements, antagonism, frustrations and finally into dispute. It was revealed from experiences in different projects of public owners and contractor's perceptions and assessment. Therefore, the project participants must realize that they have to break this conflict levels by discovering the problems in timely manner to prevent and reduce conflicts during construction.

As a result some explicit recommendations and suggestions are made to each of the critical conflict issues to have improvement in preventing and reducing conflicts in time with appropriate solutions. The recommendations for project participants are presented in the following sections. However, for public owners and public departments are recommended separately since it has different duties and responsibilities. The public owner refers mainly to government engineers who perform duties at construction project level. On the other hand, the public departments are the concerned agencies at policy level involve in decision making, enforcing rules and regulation regarding to construction of public projects.

6.3.1 Recommendations for Public owners

It is encouraged and suggested that the public owners should first of all establish good project plan with adequate time and cost for particular project. The public owner should be capable to provide effective and clear conceptual brief to design team and there should also have project consultations among project managers, engineers, architects, structural engineers and surveyors before finalizing design works to reduce problems and conflicts during construction (PO1 and PO10). It is also suggested to prepare good financial projection to have adequate funds for the project to make timely payment to contractors and for successful completion of project on time (PO5). The contract documents and technical specification must be consistent throughout the project with clear terms and conditions so that it should not have any violations and misinterpretation later. It needs to incorporate all the guidelines and regulations; reinforce risk and penalty provisions in contract documents in case of violation of any terms and conditions of contract (PO4, PO9 and PO20). In addition the payment system can be made in phase wise into certain period based on project progress such as payment can be at 40%, 80% and 100% of the work completion. This will make clearer to both the parties in terms of claims and control of the projects.

6.3.2 Recommendations for Contractors

It is encouraged and recommended that contractors should understand the project and participate in tender that has expertise to do and correctly price the works. The contractor must also understand the contract document before signing to contract agreement and it should also have clearly understand the scope and quality of works what client requires. Once the project is won, contractors are recommended to start with detailed project plans and specifications. The contractors should have competent engineers and managers that can control the project with adequate CPM/PERT type time management system in line with the work breakdown structure. It is also recommended to prepare and control project with cash control system. Contractors are also suggested to engage in project with qualified technical staff and skilled laborers. It should also plan and execute any changes of work during construction, ensure all change orders, variations and instructions are corresponds in writing, time and cost implications be approved prior to start of any activities. Also, suggested to keep good records of all orders and anything that occurs and influence to site.

6.3.3 Recommendations to public departments

The recommendations and suggestions have come up in line with the research study. The study results revealed that the conflicts during construction are more in public projects in Bhutan. Therefore, the public department or concerned agencies can look into the following recommendations and suggestions to reduce or prevent conflicts in public projects. The recommendations are such as: (1) Standardize the contract documents and procurement rules uniformly throughout the agencies, departments, districts and ministries to reduce misconception by implementing agency and contractors, (2) Evaluation criteria for selection of contractors should be made uniform throughout agencies, departments, districts and ministries to reduce misinterpretations by different clients, (3) Public department can initiate reforms in the present contractor classification systems. The small contractors can be given only specialized licenses such as for plumbing, electrical, painting, masonry, concreting, etc. instead of issuing the general construction license. It can be also given as

specialized or expertise in particular job as subcontractor group, so that the medium and large class contractors can hire the specialized small contractors to perform the specific job, (4) Revisit contract terms and conditions eg. Clauses on insurance and hindrance due to monsoon etc., (5) Bill measurement record should be in maintain in spreadsheet since bill entry in measurement book (MB) is tedious and time consuming which usually lead to delay in payment to contractors, (6) Quality should be standardized and encouraged by instituting testing facilities at different regions of the country by government or through involvement of private sector initiatives, (7) Department should look into the matters of government policy which encourages low evaluated tenders and contract price negotiation to follow BSR rates at departmental estimate which makes claims during construction and suffers quality of works, (8) Government engineers are left with unfounded allegations and procedural lapses when it has to carry out too many dispersed projects at a time (minimum 10 numbers of projects especially to district engineers). The government can either increase the number of engineers or else, full supervision and responsibility may be given to the contractor.

6.4 Summary

This chapter focuses on the analysis of root causes and management strategies to reduce conflicts during construction in public projects. First it focuses on the qualitative analysis of interview results and interpretation of root causes and management strategies for critical conflict issues that were collected from public owners during survey. Then, it focuses on the recommendations for appropriate solutions and strategies for reducing the conflicts during construction of public projects. The suggestions and recommendations to public owners, contractors and department were framed for 10 critical conflict issues to reduce conflicts in public projects. Thus the recommended strategies and solutions will enable the public owners, contractors and department to address the problems and issues in timely manner, hence can check and condense conflicts during implementation of public projects.

CHAPTER VII

RESEARCH CONCLUSION

This chapter established conclusion for the thesis. It basically describes about the conclusion based on the research findings, research contributions, limitations of research and direction for future research.

7.1 Research Conclusions

7.1.1 Perceptions of Important Conflict Issues in Public Projects

The research conducted questionnaire survey to gather the perceptions from public owners and contractors regarding the importance of conflict issues. The level of agreement on the conflict issue was calculated by ranking mean value. The value of likert scale was 1 to 5. The higher numerical value means highly agreed on the conflict issue based on public owners and contractor's perception. The results can be seen in chapter 4 which showed the ranking of 41 important conflict issues in separated groups. The separated analysis result revealed 24 conflict issues from public owner's perception and 17 conflict issues from contractor's perception as agreed. However, the conflict issues from two groups were combined and found 15 conflict issues have common from both perceptions. The conflict issues were also grouped into main issues related to project time, cost, quality, safety, scope, personnel and others perceived by public owners and contractors. It gives direct benefit of understanding which conflict issues are perceived to be most important one in separate group's perceptions. The conflict issues that are agreed and the mean value above 3.5 was considered which were needed more attentions. Finally, the analysis result revealed total of 26 ($24 + (17-15)$) conflict issues. However, these 26 important conflict issues showed similarities and significant differences in the mean scores between public owners and contractor's perceptions. From the total of 26 issues, 11 issues were found to be significantly different level of their opinion and 15 issues had similarities in the mean scores from their perceptions.

The result of conflict issues are (1) Slow progress/performance by contractor is important conflict issue related to project time. (mean=4.244), (2) Poorly develop project planning and scheduling is important conflict issue related to project time. (mean=4.222), (3) Unclear/Incomplete technical specifications are important conflict issue related to project quality (mean=4.067), (4) Inadequate quality testing facility is important conflict issue related to project quality. (mean=4.067), (5) Non-compliance with quality control/quality assurance system or processes is important conflict issue related to project quality (mean=4.044), (6) Poor workmanship or rework due to non-compliance with methods and good practices is important conflict issue related to project quality (mean=4.044), (7) Inadequate supervision, regular inspection or verification on construction site is important conflict issue related to project quality (mean=3.933), (8) An unforeseen underground condition is important conflict issue related to project scope (3.933), (9) Shortage or absence of competent technical, managerial or supervisory personnel at construction site is important conflict issue related to project personnel (mean=3.889), (10) Use of low quality & cheap materials are important conflict issue related to project quality (mean=3.867), (11) Late approval or permit from regulators is important conflict issue related to project time (mean=3.844), (12) Non-compliance with occupational health & safety regulations is important conflict issue related to project safety (mean=3.778), (13) Excessive variations of quantity such as requiring massive earth excavation are important conflict issue related to project scope (mean=3.756), (14) Lack of clear information to address the price escalation index is important conflict issue related to project cost (mean=3.750) and (15) Late payment by client is important conflict issue related to project cost (mean=3.697).

(16) Frequent change orders cause extra cost of work preparation or rework is important conflict issue related to project scope (mean=3.689) and (17) Pollution during constructions and affect to environment is important conflict issue related to environment (mean=3.689), (18) Time extension due to design changes is important conflict issue related to project time (mean=3.644), (19) Ambiguous instructions and unqualified/unskilled operators or workers are important conflict issue related to project quality (mean=3.644), (20) Irresponsibility/ Lack of commitment/attitude &

personality problem are important conflict issue related to project personnel (mean=3.644), (21) Slow decision making by client is important conflict issue related to project time (mean=3.622), (22) A different perception on work quality acceptance is important conflict issue related to project quality (mean=3.578), (23) Lack of detail drawing is important conflict issue related to project quality (mean=3.556), (24) No first aid & lifesaving appliance at construction site is important conflict issue related to project safety (mean=3.556), (25) Frequent change orders causes uncontrolled project schedule is important conflict issue related to project scope (mean=3.533) and (26) An error in contract document & violating terms & conditions of contract is important conflict issue related to project contract (mean=3.533). Therefore, these 26 issues were used for evaluating level of conflicts in public projects from public owners and contractors.

7.1.2 Evaluation of Level of Conflicts in Public Projects

To achieve the research objective, the evaluation of level of 26 conflict issues was conducted. The evaluation was based on level of conflicts in public projects on the scale from conflict level 1 (Very low) to level 5 (Very high). The five scales used for evaluation was level 1 (Very low) =Incompatibility, level 2 (Low) =Disagreement, level 3 (Moderate) =Antagonism, level 4 (High) =Frustration and level 5 (Very high) =Dispute. Respondents also rated the percentage of conflict occurrence at respective level of conflict that measure the conflicts concentration based on their actual experiences during course of construction time. The results can be seen in chapter 5 which showed level of conflicts evaluated by public owners and contractors.

The analysis, all illustrated that 21 conflict issues presented in moderate level of conflict. The result was evaluated by public owner and contractors. The public owner evaluated conflict issues are: (1) Use of low quality & cheap materials is conflict issue related to quality (CL=3.081), (2) Inadequate quality testing facility is conflict issue related to quality (CL =3.035), (3) Inadequate supervision, regular inspection or verification on construction site by client engineer is conflict issue related to quality (CL =3.021), (4) Poorly develop project planning and scheduling is

conflict issue related to time (CL =2.975), (5) Frequent change orders causes uncontrolled project schedule is conflict issue related to scope (CL =2.960), (6) Slow progress/performance by contractor is conflict issue related to time (CL =2.946), (7) Time extension due to design changes is conflict issue related to time (CL =2.929), (8) Late payment by client is conflict issue related to cost (CL =2.900), (9) An unforeseen underground condition is conflict issue related to scope (CL =2.896), (10) Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality (CL =2.871), (11) Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality (CL =2.867), (12) Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality (CL =2.854), (13) Non-compliance with occupational health & safety regulations is conflict issue related to safety (CL =2.838), (14) Frequent change orders cause extra cost of work preparation or rework is conflict issue related to scope (CL =2.817), (15) Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel (CL =2.815), (16) Slow decision making by client is conflict issue related to time (CL =2.790), (17) Lack of detail drawing is conflict issue related to quality (CL =2.785), (18) Lack of clear information to address the price escalation index is conflict issue related to cost (CL =2.763), (19) Excessive variations of quantity such as requiring massive earth excavation is conflict issue related to scope (CL =2.748), (20) Irresponsibility/ Lack of commitment/attitude & personality problems is conflict issue related to personnel (CL=2.746) and (21) Unclear/ Incomplete technical specifications is conflict issue related to quality (CL =2.700).

The contractor evaluated conflict issues are: (1) Unclear/Incomplete technical specifications are conflict issue related to quality (CL=2.898), (2) Late payment by client is conflict issue related to cost (CL=2.893), (3) Lack of detail drawing is conflict issue related to quality (CL=2.820), (4) Time extension due to design changes is conflict issue related to time (CL=2.809), (5) Frequent change orders causes uncontrolled project schedule is conflict issue related to scope (CL=2.800), (6) Inadequate supervision, regular inspection or verification on construction site is conflict issue related to quality (CL=2.780), (7) Slow decision making by client is

conflict issue related to time (CL=2.748), (8) Ambiguous instructions and unqualified/unskilled operators or workers is conflict issue related to quality (CL=2.730), (9) Lack of clear information to address the price escalation index is conflict issue related to cost (CL=2.721), (10) Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality (CL=2.702), (11) Non-compliance with quality control/quality assurance system or processes is conflict issue related to quality (CL=2.660), (12) Shortage or absence of competent technical, managerial or supervisory personnel at construction site is conflict issue related to personnel (2.652), (13) Irresponsibility/ Lack of commitment/attitude & personality problems is conflict issue related to personnel (2.638) and (14) Poorly develop project planning and scheduling is conflict issue related to time (CL=2.622). Thus the conflict levels for all the conflicts issues was found to be in moderate level where it had mostly experienced in antagonism situation between parties during construction phase.

7.1.3 Root Causes and Solutions to Reduce Critical Conflicts in Public Projects

The root causes and solutions to reduce conflicts in public projects were found for 10 critical conflict issues. These were evaluated by public owners. The 10 critical conflict issues are such as (1) Use of low quality & cheap materials is conflict issue related to quality, (2) Inadequate quality testing facility is conflict issue related to quality, (3) Inadequate supervision, regular inspection or verification on construction site by client engineer is conflict issue related to quality, (4) Poorly develop project planning and scheduling is conflict issue related to time, (5) Frequent change orders causes uncontrolled project schedule is conflict issue related to scope, (6) Slow progress/performance by contractor is conflict issue related to time, (7) Time extension due to design changes is conflict issue related to time, (8) Late payment by client is conflict issue related to cost, (9) An unforeseen underground condition is conflict issue related to scope, (10) Poor workmanship or rework due to non-compliance with methods and good practices is conflict issue related to quality. The detail about root causes and solutions were discussed in chapter 6.

7.2 Research Contribution

This research contributes mainly in two aspects, the future research and construction industry. The first contribution is to the prospective of future research and academic by describing the specific area of conflict issues between public owners and contractors during construction phase. The outcome of this research is the list of 41 important conflict issues in public projects from the perspectives of public owners and contractors. Furthermore, from these perceived important conflict issues, 26 conflict issues were selected for evaluation. The evaluation was conducted with new approach to assess actual field experiences in construction of Bhutanese public projects. This research contributed new approach for evaluating level of conflicts that explained the conflict distribution against the percentage of occurrences at various levels of conflicts. This approach can add further support to earlier researches on conflict management as none of the previous studies has done on actual evaluation at construction phase (Sedairy, 1994; Acharya, 2006; Stanslaus, 2011). This list of conflict issues from perceptions and evaluated conflict issues with new approach can be used in the future for improvement to current approach and can carry out specific project based on case study. The future researchers can focus on particular nature of construction projects elaborated on any area of specific project management issues such as related to time, cost, quality, safety, scope, personal and others.

The second contribution is to the construction practitioners in the industry by illustrating the important conflict issues based on perception and evaluation results. It contributes to realize on what important conflict issues and level of conflicts during construction phase between public owners and contractors are predominant in public projects. The explanations for this research are detailed from three different techniques. First, it describes about the identifying level of agreement on important conflict issues from public owners and contractor's perceptions. Second, it describes about the evaluating level of conflict issues in public projects from public owners and contractors. Third, it describes about the analyzing root causes and finding appropriate solutions to reduce such conflicts during construction. The result of this research is expected to contribute for the public owners and contractors to see which

conflict issues are the most important one and what level of conflicts on public projects are dominated. As the saying goes “Prevention is better than cure”. Therefore this research result could be used as the proactive measures while undertaking any public projects, by supporting to make necessary decisions and preventive measures.

Both the results from level of agreement on important conflict issues from perceptions and conflict levels from evaluation by public owners and contractors will contribute empirical evidences. Since the construction conflict issues are on extreme rise in the public projects with developmental activities taking place in Bhutan. Last but not least, this research intent as the basis for the policy makers and construction practitioners to comprehend the facts of construction practices and how the conflict issues are prevailed in the construction industry. Thus, it is hoped that focusing on the government as a policy maker in the industry will help it in gaining the required attention it needs for its implementation besides the project performers could equip with techniques and skills for effective management of conflicts while captivating task on public projects.

7.3 Limitations and direction for future research

This research has many repercussions as well as limitations. The first limitation was the sample size and research time. The sample used for this research was covered public owners and contractors involved in public projects. The result of this research may not fully characterize the public owners and contractor’s perceptions and on evaluation of conflict levels in Bhutanese public construction projects. The non-availability of sampling from other respondents in other regions of country may implicate the results. So, the future researchers are suggested to use larger sample from other regions of the country to explore the important conflict issues and evaluate level of conflicts in public projects.

The second limitation was the survey method in evaluation of conflict issues. This study used random approach using questionnaires and interview techniques in identifying the important conflict issues and evaluating the level of conflicts mostly

from the past projects based on public owners and contractor's experiences. This study could not focus on particular project based to identify and evaluate the level of conflict issues from that public owners and contractors engaged specifically. This was due to difficulty in getting connected of concerned public owners and contractors for already completed projects and also difficult in availing to ongoing project sites because of time limits and dispersed nature. The accessible was restricted to case sensitive projects were also the deterrent factor. Therefore, the future research are suggested to focus in particular project and parties engage in same project to ascertain more explicit evaluation result of conflict levels. The future research can also further screen the conflict issues which seems are counterfeiting and streamlined the survey approach. The future research may also review the scales and levels used for this new approach of evaluation and concentrate on particular nature of construction projects elaborated on any of specific project management issues such as related to time, cost, quality, safety, scope, personal and others. Furthermore, future research may also try to compare the public buildings and infrastructure projects from separate perspectives and evaluation of level of conflicts.

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APPENDICES

APPENDIX A
SURVEY QUESTIONNAIRE FORM AND DATA IN PART-I

Appendix A.1 Survey Questionnaire Form for Part-I

SECTION A

A. Please indicate by ticking (✓) in the box applicable and fill the questions:

1. Your Organization

Public Department Contractor Organization

2. Company / Department Name: _____

3. Position: _____

4. Your Qualification (Diploma / Bachelor Degree / Master Degree/ Others)

5. Personnel Experience in Public Projects : _____ years

6. Type of Project

Public Building Infrastructures

SECTION B

Question1: Please kindly, indicate by ticking (✓) in the number that represents your response (agreement or disagreement) for importance of each issue according to the following scale:

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Scale	1	2	3	4	5

Identification of Important Conflict Issues between Public owners and Contractors during Construction Phase						
I	Conflict Issues related to Project Time					
1a	Slow decision making by client is a conflict issue related to project time.	1	2	3	4	5
1b	Poorly develop project planning and scheduling is a conflict issue related to project time.	1	2	3	4	5
1c	Late handover and change the location of construction sites/areas is a conflict issue related to project time.	1	2	3	4	5
1d	Time extension request (inadequately or not reflect to contract) for delays caused by adverse weather conditions and acts of god is a conflict issue related to project time.	1	2	3	4	5
1e	Delay of construction project due to material shortage is a conflict issue related to project time.	1	2	3	4	5

1f	Late approval or permit from regulators is a conflict issue related to project time.	1	2	3	4	5
1g	Time extension due to design changes is a conflict issue related to project time.	1	2	3	4	5
1h	Slow progress/performance by contractor is a conflict issue related to project time.	1	2	3	4	5
1i	Time compensation for delay caused by external influence such as bureaucratic/ political/public interruptions is a conflict issue related to project time.	1	2	3	4	5
1j	Long waiting time for drawing approval is a conflict issue related to project time.	1	2	3	4	5
1k	Delay of project schedule due to equipment shortages is a conflict issue related to project time.	1	2	3	4	5
1l	Financial problems/bankruptcy of contractors caused delay in construction project is a conflict issue related to project time.	1	2	3	4	5
II	Conflict Issues related to Project Cost					
2a	Late payment by client is a conflict issue related to project cost.	1	2	3	4	5
2b	Quantity errors in BOQ affect calculating work quantity for payment is a conflict issue related to cost.	1	2	3	4	5
2c	Unrealistic cost negotiation for new items are conflict issue related to project cost.	1	2	3	4	5
2d	Lack of clear information to address the price escalation index is a conflict issue related to project cost.	1	2	3	4	5
2e	Payment for overtime working due to urgency of government or unexpected social events is a conflict issue related to project cost.	1	2	3	4	5
2f	Cost of Rework from non-sequencing work due to government or unexpected social events request is a conflict issue related to project cost.	1	2	3	4	5
III	Conflict Issues related to Project Quality					
3a	Non-compliance with quality control/quality assurance system or processes is conflict issue related to project quality.	1	2	3	4	5
3b	Poor workmanship or rework due to non-compliance with methods and good practices is a conflict issue related to project quality.	1	2	3	4	5
3c	Unclear/Incomplete technical specification is conflict issue related to project quality.	1	2	3	4	5
3d	Lack of detail drawing is a conflict issue related to project quality.	1	2	3	4	5
3e	Use of outdated drawings and specification is a conflict issue related to project quality.	1	2	3	4	5
3f	Use of low quality & cheap material is a conflict issue related to project quality.	1	2	3	4	5

3g	Inadequate quality testing facility is a conflict issue related to project quality.	1	2	3	4	5
3h	Inadequate supervision, regular inspection or verification on construction site is a conflict issue related to project quality.	1	2	3	4	5
3i	Ambiguous instructions and unqualified/unskilled operators or worker is a conflict issue related to project quality.	1	2	3	4	5
3j	A different perception on work quality acceptance is a conflict issue related to project quality.	1	2	3	4	5
3k	Owner acceleration of work progress by rushing activities causes poor quality of work is a conflict issue related to project quality.	1	2	3	4	5
IV	Conflict Issues related to Project Safety					
4a	Non-compliance with occupational health & safety regulations is a conflict issue related to project safety.	1	2	3	4	5
4b	No first aid & lifesaving appliance at construction site is a conflict issue related to project safety.	1	2	3	4	5
4c	Employment of illegal labor (child labor) is a conflict issue related to project safety.	1	2	3	4	5
V	Conflict Issues related to Scope					
5a	Frequent change orders cause extra cost of work preparation or rework is a conflict issue related to project scope.	1	2	3	4	5
5b	Frequent change orders causes uncontrolled project schedule is a conflict issue related to project scope.	1	2	3	4	5
5c	An unforeseen underground condition is a conflict issue related to project scope.	1	2	3	4	5
5d	Unclear debris and construction junks are a conflict issue related to project scope.	1	2	3	4	5
5e	Excessive variations of quantity such as requiring massive earth excavation is a conflict issue related to project scope.	1	2	3	4	5
VI	Conflict Issues related to Project Personal and others					
6a	Pollution during constructions and affect to environment is a conflict issue related to environment.	1	2	3	4	5
6b	An error in contract document & violating terms & conditions of contract is a conflict issue related to project contract.	1	2	3	4	5
6c	Irresponsibility/ Lack of commitment/attitude & personality problem is a conflict issue related to project personnel.	1	2	3	4	5
6d	Shortage or absence of competent technical, managerial or supervisory personnel at construction site is a conflict issue related to project personnel.	1	2	3	4	5

Appendix A.2 Raw data from Survey Questionnaire in Part-I

Sl.No	Respondent	Time											Cost						Quality							Safety			Scope					Personnel									
		1a	1b	1c	1d	1e	1f	1g	1h	1i	1j	1k	1l	2a	2b	2c	2d	2e	2f	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k	4a	4b	4c	5a	5b	5c	5d	5e	6a	6b	6c	6d	
1	PO1	4	4	4	3	2	3	3	2	3	2	2	4	2	3	2	3	2	3	3	2	4	4	2	2	3	3	3	3	4	3	5	2	4	4	4	3	4	4	4	2	3	2
2	PO2	4	5	5	5	3	5	5	5	5	5	2	1	5	5	1	5	5	3	5	5	4	1	3	5	5	1	5	3	1	1	1	1	1	5	3	1	5	3	5	5	5	
3	PO3	4	5	5	5	4	4	4	5	4	4	5	5	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	5
4	PO4	3	4	4	4	3	4	4	4	3	3	2	1	2	4	3	3	3	3	4	4	2	1	1	4	4	4	4	3	1	4	4	1	2	2	3	3	4	3	3	4	5	
5	PO5	3	4	2	2	2	4	3	5	1	2	2	3	2	3	4	3	1	3	5	5	5	2	1	5	4	3	3	3	3	3	5	2	5	4	4	3	5	3	2	3	1	
6	PO6	4	4	3	2	2	4	4	5	1	2	1	3	2	4	4	3	4	3	5	4	4	5	4	1	1	1	2	3	4	4	1	1	3	3	4	4	4	4	3	3	1	
7	PO7	2	5	2	2	3	2	4	5	4	2	2	1	4	4	4	4	3	3	5	4	4	4	4	5	4	4	5	4	4	4	3	3	3	3	3	4	4	4	4	3	4	5
8	PO8	4	4	4	3	3	4	3	4	3	3	3	2	2	2	2	2	2	3	4	3	3	2	3	3	4	3	3	4	3	2	2	2	2	3	2	2	3	2	3	2	3	4
9	PO9	4	5	4	5	5	4	4	4	4	2	4	3	4	4	3	2	3	4	4	5	5	4	3	4	4	4	4	3	4	4	4	3	4	3	4	3	3	5	4	4	4	
10	PO10	4	3	4	2	2	3	2	4	3	3	4	2	2	3	2	2	3	4	4	4	4	4	4	4	4	4	3	4	4	3	3	3	3	4	3	3	4	3	3	4	4	
11	PO11	2	4	4	5	5	5	4	5	4	4	3	5	5	5	5	4	4	4	5	5	5	5	4	5	4	5	5	4	4	5	4	4	5	5	5	4	4	4	5	5	4	
12	PO12	4	5	5	3	5	5	5	3	3	5	5	3	5	4	4	4	3	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
13	PO13	5	4	4	4	5	5	4	5	4	5	5	5	4	3	4	3	3	3	3	4	4	4	5	5	4	4	4	5	4	4	4	4	3	4	5	4	4	4	4	4	4	5
14	PO14	1	2	2	5	5	3	4	3	1	2	2	5	3	4	3	5	3	3	4	4	4	3	3	4	4	4	4	4	3	4	3	5	5	4	5	5	5	5	4	4	5	
15	PO15	3	3	5	4	4	5	5	5	4	5	5	5	4	4	4	4	4	3	4	4	5	4	5	5	4	4	3	4	4	3	2	3	3	4	4	4	3	3	2	5		
16	PO16	4	2	2	4	4	5	5	4	4	2	4	4	2	4	5	4	4	4	4	4	4	5	5	5	5	4	4	5	5	4	4	4	5	4	5	4	5	2	4	5	4	4
17	PO17	4	3	3	4	4	4	4	5	3	4	4	4	3	3	4	3	2	4	4	4	4	4	4	5	4	4	4	4	4	4	2	4	4	4	5	4	4	4	4	4	4	4
18	PO18	2	3	4	3	5	2	4	5	5	3	3	5	5	5	3	3	1	2	5	5	4	2	2	4	4	4	3	2	3	3	1	2	2	2	1	2	2	3	3	4	5	
19	PO19	1	2	2	2	2	3	3	4	3	3	3	2	3	2	2	1	2	3	3	2	4	3	3	2	4	4	2	4	3	3	4	3	3	3	2	4	4	4	3	3	4	
20	PO20	3	4	4	5	4	4	4	5	4	3	5	3	4	2	2	2	4	3	4	4	4	4	5	5	5	4	4	4	4	5	5	5	4	4	4	3	4	3	3	3	5	
21	PO21	3	5	3	3	4	4	3	4	4	4	4	3	4	3	3	4	3	3	4	4	5	4	4	5	4	4	4	4	4	5	5	4	3	4	3	3	3	3	3	4	4	
22	PO22	4	5	4	3	5	4	3	4	5	4	4	5	4	4	5	4	3	3	5	5	4	4	4	5	5	5	4	3	4	4	3	4	5	4	4	3	4	3	4	5	5	

Sl.No	Respondent	Time											Cost						Quality										Safety			Scope					Personnel										
		1a	1b	1c	1d	1e	1f	1g	1h	1i	1j	1k	1l	2a	2b	2c	2d	2e	2f	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k	4a	4b	4c	5a	5b	5c	5d	5e	6a	6b	6c	6d					
23	PO23	4	5	4	2	3	4	4	3	3	4	4	4	4	4	4	3	3	4	4	4	4	4	4	5	5	4	4	4	4	3	3	4	3	4	4	4	4	4	4	4	4	4	4	4	4	
24	PO24	4	5	3	3	4	4	4	4	3	4	3	3	3	3	3	4	4	4	4	3	3	3	4	3	3	4	2	2	3	3	3	4	4	3	4	3	4	3	4	4	4	3	4	4	4	
25	PO25	5	5	4	4	3	4	4	5	4	4	3	3	4	3	3	4	3	4	4	4	4	3	3	4	4	3	3	4	3	4	4	3	3	4	4	4	4	4	4	4	4	3	3	4	3	
26	PO26	3	5	3	3	4	4	3	4	4	4	4	3	4	3	3	4	3	3	4	4	5	4	4	4	4	4	4	4	4	5	5	4	3	4	3	3	3	3	3	3	3	3	4	3	4	
27	PO27	4	5	4	3	5	4	3	3	5	3	3	5	4	4	5	4	3	3	5	5	4	4	4	5	5	5	4	3	4	4	3	4	4	3	4	5	3	4	3	4	3	4	3	4	5	5
28	PO28	4	4	3	2	3	4	4	3	3	4	4	4	4	4	4	4	3	3	4	4	4	4	4	4	5	5	4	4	4	4	3	3	4	4	4	4	4	4	4	3	4	3	4	3	4	
29	PO29	4	5	4	4	4	4	4	4	3	4	3	3	3	3	4	4	4	4	3	3	3	3	2	3	3	4	2	2	2	3	3	2	3	4	4	3	2	4	3	2	2	2	2	2		
30	PO30	5	5	4	4	3	4	3	5	3	4	3	3	4	3	4	4	2	2	4	4	4	3	3	2	2	3	3	4	2	4	4	3	4	3	4	4	4	4	4	4	4	3	4	4		
31	PO31	4	5	4	4	2	2	2	4	3	3	2	2	3	3	4	2	2	1	3	3	4	2	2	3	3	3	3	3	3	3	3	4	3	3	4	3	3	4	3	2	3	3	3	2	2	
32	PO32	4	5	4	4	3	4	4	5	4	4	3	3	4	3	3	4	3	4	4	4	4	3	3	4	4	3	3	4	3	4	4	3	3	4	4	4	4	4	4	4	4	4	3	3	3	
33	PO33	3	5	3	3	4	4	3	4	4	4	4	3	2	3	3	4	3	3	4	4	5	4	4	4	5	4	4	4	4	4	5	5	4	3	4	3	3	3	3	3	3	3	4	4	4	
34	PO34	4	5	4	3	5	4	3	4	5	3	3	5	2	4	5	4	3	3	5	5	4	4	4	5	5	5	4	3	4	4	3	4	5	4	4	3	4	3	4	3	4	5	5	5	5	
35	PO35	3	3	3	2	3	4	4	3	3	4	4	4	4	4	4	4	3	3	4	4	4	4	4	4	5	5	4	4	4	4	3	3	4	3	4	4	4	4	4	3	4	3	4	3	4	
36	PO36	4	5	4	4	4	4	4	4	3	4	3	3	3	3	4	4	4	4	3	3	3	3	2	3	3	4	2	2	2	3	3	2	3	4	4	3	2	4	3	2	2	2	2	2		
37	PO37	5	4	4	3	3	4	3	5	3	4	3	3	3	3	4	4	2	2	4	3	4	3	3	2	2	3	3	4	2	4	3	3	3	3	3	3	3	3	3	4	4	4	3	3		
38	PO38	4	5	4	3	2	2	2	3	3	3	2	2	3	3	4	2	2	1	3	3	4	2	2	3	3	2	2	3	3	3	3	4	3	3	4	2	2	2	2	2	2	3	2	2		
39	PO39	3	4	4	3	2	2	3	4	3	3	3	3	3	4	4	3	3	3	3	4	4	3	3	2	3	4	3	3	3	3	2	3	4	4	3	3	3	3	3	3	3	3	3	3	3	
40	PO40	4	4	3	4	3	3	4	5	4	2	2	4	3	4	3	4	3	3	4	4	4	4	3	4	4	4	4	4	4	4	3	3	3	3	3	3	4	4	4	4	3	3	4	4	4	
41	PO41	5	4	5	3	2	5	5	5	5	5	3	3	4	4	3	3	3	3	5	5	5	5	5	5	4	5	5	4	5	5	5	5	5	5	5	5	4	4	4	4	5	5	4	5	5	
42	PO42	5	5	5	4	3	4	4	5	4	4	4	5	4	5	4	3	4	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	4	4	4	4	5	5	5	5	5	5	
43	PO43	4	4	4	3	4	5	4	4	4	4	4	3	3	4	4	4	3	3	5	5	5	4	4	4	5	5	5	4	3	5	5	3	4	4	4	4	4	5	5	4	4	5	4	4	5	
44	PO44	3	5	3	4	1	5	2	5	1	2	2	2	5	3	3	4	1	4	3	3	2	2	1	2	4	4	3	3	4	2	2	1	3	3	4	4	4	4	5	3	3	3	3	3		

Sl.No	Respondent	Time											Cost						Quality										Safety			Scope					Personnel						
		1a	1b	1c	1d	1e	1f	1g	1h	1i	1j	1k	1l	2a	2b	2c	2d	2e	2f	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k	4a	4b	4c	5a	5b	5c	5d	5e	6a	6b	6c	6d	
45	PO45	3	3	2	4	4	3	4	5	3	3	2	3	4	4	4	4	3	4	4	4	3	4	2	4	4	4	3	4	4	4	4	5	4	5	4	5	3	4	4	4		
46	C1	4	3	1	2	3	4	3	3	3	2	5	4	3	4	5	4	3	3	3	4	4	1	2	2	3	5	5	4	3	3	2	3	3	3	3	4	4	5	2	2		
47	C2	5	4	5	3	3	5	5	2	5	4	3	3	4	3	3	4	4	4	5	4	4	5	5	3	4	4	3	5	5	5	4	3	5	5	4	3	4	4	4	5		
48	C3	1	1	1	5	4	1	1	1	1	1	5	5	5	5	5	5	5	2	4	5	5	5	5	4	5	5	4	3	4	4	3	5	4	3	4	4	4	4	5	5	4	
49	C4	2	3	1	3	4	3	4	2	1	3	3	1	3	2	2	3	2	2	2	3	3	4	2	3	2	4	3	3	3	4	5	2	2	3	2	2	2	3	3	3	4	
50	C5	4	4	5	4	4	5	5	5	4	5	4	5	5	5	4	4	4	4	5	4	4	5	4	2	3	2	3	3	4	4	4	2	4	4	4	3	5	4	4	3	4	
51	C6	5	5	5	5	2	5	5	2	5	5	2	1	4	5	4	4	4	2	5	5	5	5	5	5	5	5	4	5	4	5	5	4	5	4	2	2	4	5	5	5	5	
52	C7	3	2	4	4	4	3	4	3	4	4	2	3	2	1	2	4	1	1	1	2	2	2	2	2	1	3	2	3	2	4	4	2	3	2	1	3	4	2	3	3	2	
53	C8	5	3	3	5	4	4	4	4	3	5	3	2	1	1	1	1	4	4	4	4	4	5	3	3	3	4	3	4	3	4	5	3	3	4	4	4	4	4	3	3	3	
54	C9	5	4	3	2	3	3	3	4	3	2	3	4	3	4	4	3	3	2	3	3	4	3	1	2	2	3	4	5	4	3	3	2	3	3	3	3	4	3	4	3	2	
55	C10	5	4	5	3	3	5	5	4	5	4	3	3	4	3	3	3	4	4	3	4	3	5	4	3	4	4	3	4	4	4	4	3	5	4	4	3	4	3	3	4	4	
56	C11	3	2	2	3	4	1	1	2	1	1	3	5	5	5	5	5	5	2	4	5	5	5	5	4	5	5	4	3	4	4	4	4	4	3	3	4	3	4	4	5	4	
57	C12	2	4	1	3	4	2	3	4	1	3	3	1	3	2	2	3	2	2	2	3	3	4	2	3	2	4	3	3	3	3	4	1	2	3	2	2	2	2	3	3	2	
58	C13	5	4	4	3	4	3	4	5	4	5	4	5	3	3	4	4	4	4	3	4	4	5	4	2	3	2	3	3	3	4	4	2	3	4	3	3	4	4	3	3	3	
59	C14	5	4	5	4	2	5	5	4	5	4	2	4	4	4	4	4	4	2	4	5	4	5	4	4	5	5	4	5	4	4	4	4	4	4	3	2	2	4	4	4	3	4
60	C15	4	3	3	4	4	3	3	3	4	4	2	3	4	1	2	4	1	1	2	3	2	3	2	2	2	3	2	3	2	3	4	2	3	2	1	3	4	2	4	4	2	
61	C16	5	3	3	5	4	4	3	4	3	5	3	2	3	1	2	3	4	4	4	3	4	4	5	3	3	3	4	3	4	3	4	5	3	3	4	4	4	4	4	3	3	3
62	C17	4	3	3	5	4	2	2	3	2	2	5	5	4	4	5	4	5	4	2	4	5	5	4	4	4	4	3	3	3	3	3	5	3	3	3	4	4	4	3	3	4	
63	C18	3	3	2	3	4	3	4	3	1	3	3	2	4	2	2	3	2	2	3	3	2	4	2	3	2	4	3	3	3	4	5	2	2	3	2	2	2	3	3	4	4	
64	C19	4	5	5	4	4	5	4	5	4	5	5	4	4	4	4	3	4	4	5	3	3	4	4	2	3	2	3	3	4	4	3	3	4	3	4	3	3	4	4	3	3	
65	C20	3	4	3	3	3	5	5	3	3	3	2	3	4	5	4	5	4	3	4	4	4	5	4	4	5	4	5	4	5	4	4	4	3	2	3	4	4	4	4	4	4	
66	C21	4	4	2	2	3	3	4	3	4	3	3	3	4	3	2	4	3	2	2	2	3	2	3	2	1	3	2	3	2	4	3	2	3	2	2	3	4	3	3	3	3	

Sl.No	Respondent	Time											Cost						Quality										Safety			Scope					Personnel					
		1a	1b	1c	1d	1e	1f	1g	1h	1i	1j	1k	1l	2a	2b	2c	2d	2e	2f	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k	4a	4b	4c	5a	5b	5c	5d	5e	6a	6b	6c	6d
67	C22	4	4	4	4	4	4	4	3	5	3	2	2	2	2	4	4	4	5	4	4	4	4	3	3	3	4	3	4	3	4	4	3	3	4	3	4	4	3	3	3	
68	C23	4	4	3	2	3	3	3	3	2	3	4	4	4	4	3	3	2	3	3	4	3	1	2	2	3	4	5	4	3	3	2	3	3	3	3	4	3	4	4	2	
69	C24	4	5	5	3	3	5	5	3	5	4	3	3	4	3	3	4	4	3	4	3	5	4	3	4	4	3	4	4	4	4	3	5	2	4	3	4	3	3	4	4	
70	C25	4	4	2	3	4	1	1	1	1	1	3	5	5	5	5	5	5	2	4	5	5	5	5	4	5	5	4	3	4	4	4	4	3	3	4	3	3	4	5	4	
71	C26	4	4	1	3	4	2	3	2	1	3	3	1	3	2	2	3	2	2	2	3	3	4	2	3	2	4	3	3	3	3	4	1	2	3	2	2	2	4	3	4	2
72	C27	3	4	4	3	4	3	4	5	4	5	4	5	3	3	4	4	4	3	4	4	5	4	2	3	2	3	3	3	4	4	2	3	4	3	3	4	4	3	4	3	
73	C28	3	5	5	4	2	5	5	3	5	4	2	4	4	4	4	4	2	4	5	4	5	4	4	5	5	4	5	4	4	4	4	4	4	3	2	2	4	3	4	3	4
74	C29	4	4	3	4	4	3	3	3	4	4	2	3	4	1	2	4	1	1	2	3	2	3	2	2	3	2	3	2	3	4	2	3	2	1	3	4	4	4	3	2	
75	C30	4	4	3	3	2	2	3	4	3	4	3	3	4	3	3	3	3	4	3	4	4	3	3	4	3	4	3	4	5	4	5	3	3	4	4	4	4	3	3	3	
76	C31	3	5	5	3	3	5	5	2	5	4	3	3	4	3	3	3	4	4	3	4	3	5	4	3	4	4	3	4	3	4	4	3	5	3	4	3	4	3	3	4	4
77	C32	4	4	2	3	4	1	1	3	1	1	3	5	5	5	5	5	5	2	4	5	5	5	5	4	5	5	4	3	4	4	4	4	4	3	3	4	3	3	4	5	4
78	C33	3	4	3	2	2	3	3	2	2	3	3	2	4	2	2	3	2	2	2	3	3	4	2	3	2	4	3	3	3	4	4	2	2	3	2	2	2	2	3	5	2

APPENDIX B
ANALYSIS OF SURVEY QUESTIONNAIRES IN PART-I

Appendix B.1 Item Description for Part-I

Item	Item Description
1a	Slow decision making by client is a conflict issue related to project time.
1b	Poorly develop project planning and scheduling is a conflict issue related to project time.
1c	Late handover and change the location of construction sites/areas is a conflict issue related to project time.
1d	Time extension request (inadequately or not reflect to contract) for delays caused by adverse weather conditions and acts of god is a conflict issue related to project time.
1e	Delay of construction project due to material shortage is a conflict issue related to project time.
1f	Late approval or permit from regulators (road permit, environmental clearance, building, municipal permit or approval etc.) is a conflict issue related to project time.
1g	Time extension due to design changes is a conflict issue related to project time.
1h	Slow progress/performance by contractor is a conflict issue related to project time.
1i	Time compensation for delay caused by external influence such as bureaucratic/ political/public interruptions is a conflict issue related to project time.
1j	Long waiting time for drawing approval is a conflict issue related to project time.
1k	Delay of project schedule due to equipment shortages is a conflict issue related to project time.
1l	Financial problems/bankruptcy of contractors caused delay in construction project is a conflict issue related to project time.
2a	Late payment by client is a conflict issue related to project cost.
2b	Quantity errors in BOQ affect calculating work quantity for payment is a conflict issue related to cost.
2c	Unrealistic cost negotiation for new items are a conflict issue related to project cost.
2d	Lack of clear information to address the price escalation index is a conflict issue related to project cost.
2e	Payment for overtime working due to urgency of government or unexpected social events is a conflict issue related to project cost.
2f	Cost of Rework from non-sequencing work due to government or unexpected social events request is a conflict issue related to project cost.
3a	Non-compliance with quality control/quality assurance system or processes is a conflict issue related to project quality.

3b	Poor workmanship or rework due to non-compliance with methods and good practices is a conflict issue related to project quality.
3c	Unclear/Incomplete technical specifications are conflict issue related to project quality.
3d	Lack of detail drawing is a conflict issue related to project quality.
3e	Use of outdated drawings and specifications is a conflict issue related to project quality.
3f	Use of low quality & cheap materials is a conflict issue related to project quality.
3g	Inadequate quality testing facility is a conflict issue related to project quality.
3h	Inadequate supervision, regular inspection or verification on construction site is a conflict issue related to project quality.
3i	Ambiguous instructions and unqualified/unskilled operators or workers are conflict issue related to project quality.
3j	A different perception on work quality acceptance is a conflict issue related to project quality.
3k	Owner acceleration of work progress by rushing activities causes poor quality of work is a conflict issue related to project quality.
4a	Non-compliance with occupational health & safety regulations is a conflict issue related to project safety.
4b	No first aid & lifesaving appliance at construction site is a conflict issue related to project safety.
4c	Employment of illegal labor (child labor) is a conflict issue related to project safety.
5a	Frequent change orders cause extra cost of work preparation or rework is a conflict issue related to project scope.
5b	Frequent change orders causes uncontrolled project schedule is a conflict issue related to project scope.
5c	An unforeseen underground condition is a conflict issue related to project scope.
5d	Unclear debris and construction junks are conflict issue related to project scope.
5e	Excessive variations of quantity such as requiring massive earth excavation are conflict issue related to project scope.
6a	Pollution during constructions and affect to environment is a conflict issue related to environment.
6b	An error in contract document & violating terms & conditions of contract is a conflict issue related to project contract.
6c	Irresponsibility/ Lack of commitment/attitude & personality problem are conflict issue related to project personnel.
6d	Shortage or absence of competent technical, managerial or supervisory personnel at construction site is a conflict issue related to project personnel.

Appendix B.2 Group Statistics for Part-I

Group Statistics					
Item	Respondent Type	N	Mean	Std. Deviation	Std. Error Mean
1a	Public Owner	45	3.62	0.960	0.143
	Contractor	33	3.79	0.992	0.173
1b	Public Owner	45	4.22	0.927	0.138
	Contractor	33	3.73	0.911	0.159
1c	Public Owner	45	3.64	0.883	0.132
	Contractor	33	3.21	1.409	0.245
1d	Public Owner	45	3.42	0.941	0.140
	Contractor	33	3.39	0.933	0.162
1e	Public Owner	45	3.44	1.099	0.164
	Contractor	33	3.42	0.751	0.131
1f	Public Owner	45	3.84	0.878	0.131
	Contractor	33	3.36	1.365	0.238
1g	Public Owner	45	3.64	0.802	0.120
	Contractor	33	3.55	1.277	0.222
1h	Public Owner	45	4.24	0.802	0.120
	Contractor	33	3.15	1.093	0.190
1i	Public Owner	45	3.44	1.035	0.154
	Contractor	33	3.12	1.474	0.257
1j	Public Owner	45	3.44	0.943	0.141
	Contractor	33	3.42	1.324	0.230
1k	Public Owner	45	3.22	1.020	0.152
	Contractor	33	3.12	0.893	0.155
1l	Public Owner	45	3.33	1.168	0.174
	Contractor	33	3.24	1.393	0.242
2a	Public Owner	45	3.44	0.943	0.141
	Contractor	33	3.70	0.918	0.160
2b	Public Owner	45	3.56	0.755	0.113
	Contractor	33	3.15	1.372	0.239
2c	Public Owner	45	3.56	0.918	0.137
	Contractor	33	3.27	1.206	0.210
2d	Public Owner	45	3.49	0.869	0.130
	Contractor	33	3.64	0.962	0.168
2e	Public Owner	45	2.96	0.878	0.131
	Contractor	33	3.42	1.200	0.209
2f	Public Owner	45	3.16	0.796	0.119
	Contractor	33	3.09	1.259	0.219
3a	Public Owner	45	4.04	0.737	0.110
	Contractor	33	3.06	1.144	0.199
3b	Public Owner	45	4.04	0.796	0.119
	Contractor	33	3.58	0.751	0.131
3c	Public Owner	45	4.07	0.751	0.112
	Contractor	33	3.67	0.924	0.161

Group Statistics					
Item	Respondent Type	N	Mean	Std. Deviation	Std. Error Mean
3d	Public Owner	45	3.56	1.035	0.154
	Contractor	33	4.24	0.902	0.157
3e	Public Owner	45	3.38	1.154	0.172
	Contractor	33	3.42	1.347	0.234
3f	Public Owner	45	3.87	1.100	0.164
	Contractor	33	3.09	1.042	0.181
3g	Public Owner	45	4.07	0.986	0.147
	Contractor	33	3.09	1.128	0.196
3h	Public Owner	45	3.93	0.963	0.144
	Contractor	33	3.67	0.990	0.172
3i	Public Owner	45	3.64	0.933	0.139
	Contractor	33	3.52	0.906	0.158
3j	Public Owner	45	3.58	0.812	0.121
	Contractor	33	3.70	0.847	0.147
3k	Public Owner	45	3.56	0.943	0.141
	Contractor	33	3.42	0.751	0.131
4a	Public Owner	45	3.78	0.823	0.123
	Contractor	33	3.79	0.650	0.113
4b	Public Owner	45	3.56	1.119	0.167
	Contractor	33	3.91	0.522	0.091
4c	Public Owner	45	3.24	1.246	0.186
	Contractor	33	2.91	1.128	0.196
5a	Public Owner	45	3.69	0.996	0.148
	Contractor	33	3.52	1.004	0.175
5b	Public Owner	45	3.53	0.757	0.113
	Contractor	33	3.09	0.678	0.118
5c	Public Owner	45	3.93	0.751	0.112
	Contractor	33	2.82	0.983	0.171
5d	Public Owner	45	3.40	0.809	0.121
	Contractor	33	2.97	0.684	0.119
5e	Public Owner	45	3.76	0.857	0.128
	Contractor	33	3.61	0.788	0.137
6a	Public Owner	45	3.69	0.793	0.118
	Contractor	33	3.45	0.754	0.131
6b	Public Owner	45	3.53	0.815	0.121
	Contractor	33	3.58	0.663	0.115
6c	Public Owner	45	3.64	0.830	0.124
	Contractor	33	3.64	0.822	0.143
6d	Public Owner	45	3.89	1.153	0.172
	Contractor	33	3.27	0.944	0.164

Appendix B.3 Independent Samples Test for Part-I

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
1a	Equal variances assumed	.011	.918	-.742	76	.460	-0.166	0.223	-0.610	0.279
	Equal variances not assumed			-.738	67.790	.463	-0.166	0.224	-0.613	0.282
1b	Equal variances assumed	.378	.541	2.347	76	.022	0.495	0.211	0.075	0.915
	Equal variances not assumed			2.354	69.777	.021	0.495	0.210	0.076	0.914
1c	Equal variances assumed	9.617	.003	1.663	76	.100	0.432	0.260	-0.086	0.950
	Equal variances not assumed			1.553	50.072	.127	0.432	0.278	-0.127	0.991
1d	Equal variances assumed	.053	.818	.132	76	.896	0.028	0.215	-0.400	0.456
	Equal variances not assumed			.132	69.437	.896	0.028	0.215	-0.400	0.457
1e	Equal variances assumed	6.831	.011	.091	76	.928	0.020	0.222	-0.422	0.462
	Equal variances not assumed			.096	75.688	.923	0.020	0.210	-0.397	0.438
1f	Equal variances assumed	11.783	.001	1.891	76	.062	0.481	0.254	-0.026	0.987
	Equal variances not assumed			1.772	50.945	.082	0.481	0.271	-0.064	1.025
1g	Equal variances assumed	8.267	.005	.420	76	.676	0.099	0.236	-0.371	0.569
	Equal variances not assumed			.392	50.145	.697	0.099	0.252	-0.408	0.606
1h	Equal variances assumed	2.335	.131	5.096	76	.000	1.093	0.214	0.666	1.520
	Equal variances not assumed			4.863	55.918	.000	1.093	0.225	0.643	1.543
1i	Equal variances assumed	6.548	.012	1.139	76	.258	0.323	0.284	-0.242	0.889
	Equal variances not assumed			1.080	54.167	.285	0.323	0.299	-0.277	0.923

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
1j	Equal variances assumed	5.267	.025	.079	76	.937	0.020	0.256	-0.491	0.531
	Equal variances not assumed			.075	54.733	.941	0.020	0.270	-0.521	0.561
1k	Equal variances assumed	2.846	.096	.455	76	.650	0.101	0.222	-0.341	0.543
	Equal variances not assumed			.465	73.558	.644	0.101	0.217	-0.332	0.534
1l	Equal variances assumed	1.176	.282	.313	76	.755	0.091	0.290	-0.488	0.669
	Equal variances not assumed			.305	61.597	.762	0.091	0.298	-0.506	0.688
2a	Equal variances assumed	.852	.359	-1.182	76	.241	-0.253	0.214	-0.678	0.173
	Equal variances not assumed			-1.187	70.131	.239	-0.253	0.213	-0.677	0.172
2b	Equal variances assumed	15.227	.000	1.664	76	.100	0.404	0.243	-0.080	0.888
	Equal variances not assumed			1.530	46.151	.133	0.404	0.264	-0.127	0.936
2c	Equal variances assumed	7.009	.010	1.176	76	.243	0.283	0.240	-0.196	0.762
	Equal variances not assumed			1.128	57.447	.264	0.283	0.251	-0.219	0.785
2d	Equal variances assumed	.001	.980	-.707	76	.481	-0.147	0.208	-0.563	0.268
	Equal variances not assumed			-.696	64.859	.489	-0.147	0.212	-0.570	0.276
2e	Equal variances assumed	7.561	.007	-1.994	76	.050	-0.469	0.235	-0.937	0.000
	Equal variances not assumed			-1.902	55.806	.062	-0.469	0.246	-0.962	0.025
2f	Equal variances assumed	19.889	.000	.277	76	.782	0.065	0.233	-0.400	0.529
	Equal variances not assumed			.259	50.381	.796	0.065	0.249	-0.436	0.565
3a	Equal variances assumed	8.732	.004	4.614	76	.000	0.984	0.213	0.559	1.409
	Equal variances not assumed			4.325	51.016	.000	0.984	0.227	0.527	1.440
3b	Equal variances assumed	.668	.416	2.629	76	.010	0.469	0.178	0.114	0.824
	Equal variances not assumed			2.653	71.275	.010	0.469	0.177	0.117	0.821

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
3c	Equal variances assumed	4.894	.030	2.107	76	.038	0.400	0.190	0.022	0.778
	Equal variances not assumed			2.041	60.209	.046	0.400	0.196	0.008	0.792
3d	Equal variances assumed	.750	.389	-3.054	76	.003	-0.687	0.225	-1.135	-0.239
	Equal variances not assumed			-3.120	73.656	.003	-0.687	0.220	-1.126	-0.248
3e	Equal variances assumed	2.257	.137	-.164	76	.870	-0.046	0.284	-0.612	0.519
	Equal variances not assumed			-.160	62.535	.874	-0.046	0.291	-0.628	0.535
3f	Equal variances assumed	.141	.709	3.147	76	.002	0.776	0.247	0.285	1.267
	Equal variances not assumed			3.174	71.123	.002	0.776	0.244	0.288	1.263
3g	Equal variances assumed	2.168	.145	4.061	76	.000	0.976	0.240	0.497	1.454
	Equal variances not assumed			3.977	63.431	.000	0.976	0.245	0.486	1.466
3h	Equal variances assumed	2.148	.147	1.194	76	.236	0.267	0.223	-0.178	0.711
	Equal variances not assumed			1.189	68.021	.238	0.267	0.224	-0.181	0.714
3i	Equal variances assumed	.007	.934	.612	76	.542	0.129	0.211	-0.291	0.550
	Equal variances not assumed			.615	70.255	.541	0.129	0.210	-0.290	0.549
3j	Equal variances assumed	.606	.439	-.629	76	.531	-0.119	0.189	-0.497	0.258
	Equal variances not assumed			-.625	67.368	.534	-0.119	0.191	-0.500	0.262
3k	Equal variances assumed	.766	.384	.661	76	.511	0.131	0.199	-0.265	0.527
	Equal variances not assumed			.684	75.428	.496	0.131	0.192	-0.251	0.514
4a	Equal variances assumed	.719	.399	-.058	76	.954	-0.010	0.173	-0.355	0.334
	Equal variances not assumed			-.061	75.536	.952	-0.010	0.167	-0.342	0.322
4b	Equal variances assumed	23.269	.000	-1.683	76	.096	-0.354	0.210	-0.772	0.065
	Equal variances not assumed			-1.861	66.007	.067	-0.354	0.190	-0.733	0.026

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
4c	Equal variances assumed	.382	.538	1.222	76	.226	0.335	0.275	-0.211	0.882
	Equal variances not assumed			1.241	72.604	.219	0.335	0.270	-0.203	0.874
5a	Equal variances assumed	.068	.796	.759	76	.450	0.174	0.229	-0.282	0.630
	Equal variances not assumed			.758	68.803	.451	0.174	0.229	-0.284	0.631
5b	Equal variances assumed	4.475	.038	2.663	76	.009	0.442	0.166	0.112	0.773
	Equal variances not assumed			2.709	72.901	.008	0.442	0.163	0.117	0.768
5c	Equal variances assumed	9.354	.003	5.683	76	.000	1.115	0.196	0.724	1.506
	Equal variances not assumed			5.455	57.579	.000	1.115	0.204	0.706	1.524
5d	Equal variances assumed	3.830	.054	2.474	76	.016	0.430	0.174	0.084	0.777
	Equal variances not assumed			2.539	74.395	.013	0.430	0.169	0.093	0.768
5e	Equal variances assumed	.000	.984	.787	76	.434	0.149	0.190	-0.229	0.528
	Equal variances not assumed			.797	72.115	.428	0.149		-0.224	0.523
6a	Equal variances assumed	.141	.709	1.317	76	.192	0.234	0.178	-0.120	0.589
	Equal variances not assumed			1.327	70.990	.189	0.234	0.177	-0.118	0.586
6b	Equal variances assumed	1.687	.198	-.245	76	.807	-0.042	0.173	-0.387	0.302
	Equal variances not assumed			-.253	75.120	.801	-0.042	0.168	-0.376	0.291
6c	Equal variances assumed	.012	.914	.043	76	.966	0.008	0.189	-0.369	0.385
	Equal variances not assumed			.043	69.475	.966	0.008	0.189	-0.369	0.385
6d	Equal variances assumed	.109	.742	2.513	76	.014	0.616	0.245	0.128	1.105
	Equal variances not assumed			2.591	75.001	.011	0.616	0.238	0.142	1.090

APPENDIX C
SURVEY QUESTIONNAIRE FORM, RAW DATA AND ANALYSIS IN
PART-II

Appendix C.1: Survey Questionnaire Form for Part-II

SECTION A

Please indicate by ticking (✓) in the box applicable and fill the following questions:

1. Your Organization

Public Department Contractor Organization

2. Personnel Experience in Public Project _____ years

3. Your Position (CE / PM / EE / Dy.EE/ Engineer/A.E / J.E)

4. Your Qualification (Diploma / Bachelor Degree / Master Degree/ Others)

5. Type of Project

Public Building (Institutions/Schools/Health/office/culture/Housing)

Infrastructures (Roads/Sewerage/Water supply / Irrigation / walls / dams /recreation facilities/airport)

6. Name of the Project: _____

7. Project Value = Nu _____ (Million)

8. When the project was commenced (year)? _____

9. When the project was completed (year)? _____

SECTION B

Question 1: How would you rate the conflict level in each issue given in table I? Please kindly indicate by ticking (✓) the number that represents your response (conflict level) according to the following scale:

Conflict Level	Description	Meaning of conflict level
1	Very Low	Incompatibility
2	Low	Disagreement
3	Moderate	Antagonism
4	High	Frustration
5	Very high	Dispute

Meaning of Conflict Level

Level 1: Perceived incompatibility of opinions over construction process or methods and sequences of activity during construction phase.

Level 2: Disagreement and confusion of opinions over methods or process, activities and that has tended to deviation of the works or activities during construction phase.

Level 3: Is a situation of having **Antagonisms between parties** and hatred due to severe mishaps and deviations in work because of lack of communication, coordination and without proper project control tools. Issues are raising claims and rights over time, cost, quality and safety during construction phase.

Level 4: Frustration is a situation of tension and heated due to substandard output, not satisfied with the required performance, delays, fighting for claims and hindrances, non-responsive of other party and abandonment of site during construction phase.

Level 5: Dispute is a situation involving arbitration, litigation or facing court of law due to unsatisfied claims, work suspension or termination/stoppages, breach of contract etc.

Question 2: How would you rate the percentage of occurrence of conflict issues given in table I? Please write the percentage below the conflict level mentioned that represents your response.

Examples: *Guideline to answers the questionnaires. The total percentage of occurrence of conflicts in each conflict issue must be 100%.*

Example 1: Indicating by ticking (✓) level 2 (Disagreement) with 40%, level 3 (Antagonism) with 30% and level 4 (Frustration) with 30% occurrence of conflict issues related to time due to delay of construction project caused by materials shortage.

1	2✓	3✓	4✓	5
0%	40%	30%	30%	0%

Example 2: Indicating by ticking (✓) level 2 (Disagreement) and level 3 (Antagonism) with 50% occurrence of conflict issues related to quality due to incomplete technical specifications.

1	2✓	3✓	4	5
0%	50%	50%	0%	0%

Table I: Please evaluate the following conflict issues:-

I Conflict Issues related to Project Time						
1A	Poorly develop project planning and scheduling is a conflict issue related to time	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
1B	Slow progress/performance by contractor is a conflict issue related to time	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
1C	Slow decision making by client is a conflict issue related to time	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
1D	Late approval or permit from regulators is a conflict issue related to time	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
1E	Time extension due to design changes is a conflict issue related to time	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
II Conflict Issues related to Project Cost						
2A	Lack of clear information to address the price escalation index is a conflict issue related to cost	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
2B	Late payment by client is a conflict issue related to cost	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
III Conflict Issues related to Project Quality						
3A	Unclear/Incomplete technical specifications is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
3B	Lack of detail drawing is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
3C	Poor workmanship or rework due to non-compliance with methods and good practices is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
3D	Inadequate supervision, regular inspection or	1	2	3	4	5

	verification on construction site by client engineers is a conflict issue related to quality					
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
3E	Different perceptions on work quality acceptance is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
3F	Inadequate quality testing facility is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
3G	Non-compliance with quality control/quality assurance system or processes is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	-%	-%	-%	-%
3H	Ambiguous instructions and unqualified/unskilled operators or workers is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		-%	-%	-%	-%	-%
3I	Use of low quality & cheap materials is a conflict issue related to quality	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		-%	-%	-%	-%	-%
IV	Conflict Issues related to Project Safety					
4A	Non-compliance with occupational health & safety regulations is a conflict issue related to safety	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
4B	No first aid & lifesaving appliance is a conflict issue related to safety	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
V	Conflict Issues related to Scope					
5A	Excessive variations of quantity such as requiring massive earth excavation is a conflict issue related to scope	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
5B	Frequent change orders cause extra cost of work preparation or rework is a conflict issue related to scope	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%

5C	An unforeseen underground condition is a conflict issue related to scope	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
5D	Frequent change orders causes uncontrolled project schedule is a conflict issue related to scope	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
VI	Conflict Issues related to Project Personal and others					
6A	Irresponsibility/ Lack of commitment/attitude & personality problems is a conflict issue related to personnel	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
6B	Shortage or absence of competent technical, managerial or supervisory personnel at construction site is a conflict issue related to personnel	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
6C	Pollution during constructions and affect to environment is a conflict issue related to environment	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%
6D	Errors in contract document &violating terms & conditions of contract is a conflict issue related to safety	1	2	3	4	5
	<i>Percentage of occurrence</i>	----	----	----	----	----
		%	%	%	%	%

Appendix C.2 Raw Data from Survey Questionnaire in Part-II (Conflict distribution)

Respondent	Conflict Level		Time					Cost			Quality									Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D		
PO1	Incompatibility	1	10%	10%	40%	0%	10%	10%	50%	20%	20%	20%	30%	30%	40%	40%	10%	20%	30%	30%	0%	10%	10%	10%	0%	0%	0%	30%		
	Disagreement	2	30%	40%	50%	20%	30%	40%	40%	30%	30%	30%	20%	20%	30%	30%	30%	20%	20%	30%	30%	30%	30%	30%	30%	30%	40%	30%		
	Antagonism	3	50%	50%	10%	50%	40%	40%	10%	40%	50%	40%	40%	40%	30%	30%	50%	50%	20%	20%	50%	50%	30%	50%	40%	50%	30%	30%		
	Frustration	4	10%	0%	0%	30%	20%	10%	0%	10%	0%	10%	10%	10%	10%	0%	10%	0%	20%	20%	20%	10%	30%	10%	30%	30%	30%	10%		
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	0%	0%	0%	0%	0%	0%	0%	0%		
PO2	Incompatibility	1	40%	0%	0%	0%	0%	10%	0%	20%	30%	0%	0%	20%	0%	0%	0%	0%	10%	20%	30%	20%	10%	20%	0%	20%	40%			
	Disagreement	2	40%	20%	10%	0%	20%	20%	0%	30%	30%	0%	0%	20%	0%	0%	20%	0%	10%	20%	60%	40%	20%	40%	30%	0%	20%	40%		
	Antagonism	3	10%	20%	30%	40%	20%	20%	20%	50%	30%	40%	50%	40%	50%	50%	60%	70%	80%	70%	20%	30%	30%	30%	50%	40%	20%	20%		
	Frustration	4	10%	30%	30%	40%	40%	30%	40%	0%	10%	40%	30%	20%	30%	20%	10%	10%	10%	0%	0%	0%	20%	20%	0%	40%	20%	0%		
	Dispute	5	0%	30%	30%	20%	20%	20%	40%	0%	0%	20%	20%	0%	20%	30%	10%	20%	0%	0%	0%	0%	10%	0%	0%	20%	20%	0%		
PO3	Incompatibility	1	0%	0%	0%	0%	0%	10%	0%	20%	30%	0%	0%	20%	0%	0%	0%	0%	10%	20%	30%	10%	50%	20%	0%	20%	40%			
	Disagreement	2	0%	0%	50%	0%	20%	20%	0%	30%	30%	0%	0%	20%	0%	0%	20%	0%	10%	20%	60%	40%	10%	10%	30%	0%	20%	40%		
	Antagonism	3	0%	0%	50%	40%	20%	20%	20%	50%	30%	40%	50%	40%	50%	60%	70%	80%	70%	20%	30%	20%	20%	50%	40%	20%	20%			
	Frustration	4	50%	50%	0%	40%	40%	30%	40%	0%	10%	40%	30%	20%	30%	20%	10%	10%	10%	0%	0%	0%	60%	20%	0%	40%	20%	0%		
	Dispute	5	50%	50%	0%	20%	20%	20%	40%	0%	0%	20%	20%	0%	20%	30%	10%	20%	0%	0%	0%	0%	0%	0%	0%	20%	20%	0%		
PO4	Incompatibility	1	20%	40%	20%	20%	10%	20%	10%	20%	10%	30%	30%	30%	20%	30%	40%	30%	40%	40%	10%	10%	10%	20%	40%	30%	20%	30%		
	Disagreement	2	50%	30%	30%	30%	30%	30%	20%	30%	20%	30%	20%	20%	20%	10%	10%	10%	10%	10%	40%	30%	20%	20%	20%	20%	20%	30%		
	Antagonism	3	20%	10%	30%	30%	10%	10%	40%	20%	30%	10%	30%	30%	20%	20%	30%	20%	30%	30%	30%	20%	20%	20%	20%	30%	20%	20%		
	Frustration	4	10%	20%	20%	20%	40%	20%	20%	20%	30%	30%	10%	10%	20%	30%	10%	30%	20%	20%	10%	30%	50%	40%	20%	20%	30%	10%		
	Dispute	5	0%	0%	0%	0%	10%	20%	10%	10%	10%	0%	10%	10%	20%	10%	10%	10%	0%	0%	10%	10%	0%	0%	10%	0%	10%	10%		
PO5	Incompatibility	1	20%	0%	20%	30%	10%	10%	20%	10%	20%	20%	10%	20%	10%	15%	20%	20%	20%	20%	20%	10%	20%	20%	20%	20%	20%	20%		
	Disagreement	2	20%	20%	20%	20%	30%	20%	30%	20%	30%	20%	20%	30%	30%	15%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%		
	Antagonism	3	30%	20%	30%	20%	30%	30%	25%	40%	30%	20%	20%	30%	30%	30%	30%	20%	20%	20%	30%	30%	30%	30%	20%	20%	30%	30%		
	Frustration	4	30%	60%	30%	30%	30%	40%	25%	30%	20%	20%	30%	20%	30%	30%	30%	20%	20%	20%	30%	40%	30%	30%	40%	20%	20%	15%		
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	20%	0%	0%	10%	0%	20%	20%	20%	0%	0%	0%	0%	0%	20%	10%	15%		

Respondent	Conflict Level		Time					Cost		Quality									Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D	
PO6	Incompatibility	1	40%	10%	50%	50%	50%	0%	0%	70%	70%	0%	0%	0%	0%	0%	0%	0%	60%	60%	50%	50%	10%	5%	100%	0%	100%	50%	
	Disagreement	2	40%	50%	50%	50%	50%	100%	50%	30%	30%	50%	50%	50%	50%	50%	50%	50%	40%	40%	50%	50%	20%	20%	0%	50%	0%	50%	
	Antagonism	3	20%	30%	0%	0%	0%	0%	50%	0%	0%	0%	50%	40%	0%	50%	50%	40%	0%	0%	0%	0%	20%	25%	0%	40%	0%	0%	
	Frustration	4	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	10%	50%	0%	0%	10%	0%	0%	0%	0%	50%	40%	0%	10%	0%	0%
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	
PO7	Incompatibility	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	5%	0%	0%	0%	10%	
	Disagreement	2	0%	0%	50%	0%	0%	0%	50%	30%	0%	0%	0%	30%	0%	50%	0%	30%	50%	0%	30%	50%	10%	30%	0%	0%	30%	20%	
	Antagonism	3	50%	50%	50%	30%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	30%	50%	50%	40%	50%	30%	20%	50%	50%	50%	50%		
	Frustration	4	50%	30%	0%	30%	50%	30%	0%	20%	50%	40%	50%	20%	50%	0%	50%	40%	0%	50%	30%	0%	50%	40%	50%	50%	20%	20%	
	Dispute	5	0%	20%	0%	40%	0%	20%	0%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	
PO8	Incompatibility	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	0%	0%	0%	10%	
	Disagreement	2	0%	20%	20%	30%	30%	50%	20%	40%	30%	20%	10%	20%	30%	30%	20%	30%	30%	40%	20%	40%	10%	10%	0%	0%	0%	30%	
	Antagonism	3	50%	50%	50%	20%	40%	30%	30%	30%	30%	30%	50%	30%	50%	50%	50%	20%	50%	20%	50%	40%	20%	30%	50%	50%	50%	40%	
	Frustration	4	50%	30%	30%	50%	30%	20%	40%	30%	30%	30%	20%	30%	20%	20%	30%	40%	20%	40%	30%	20%	50%	50%	50%	50%	40%	20%	
	Dispute	5	0%	0%	0%	0%	0%	0%	10%	0%	10%	10%	20%	10%	0%	0%	0%	10%	0%	0%	0%	0%	10%	0%	0%	0%	10%	0%	
PO9	Incompatibility	1	30%	20%	10%	10%	30%	0%	20%	20%	30%	20%	20%	20%	10%	10%	30%	40%	10%	10%	20%	20%	10%	10%	10%	20%	10%	10%	
	Disagreement	2	30%	40%	40%	40%	20%	30%	20%	30%	20%	10%	10%	40%	10%	30%	30%	10%	20%	20%	30%	20%	30%	10%	20%	20%	10%	30%	
	Antagonism	3	20%	30%	20%	20%	30%	30%	20%	20%	10%	30%	30%	30%	30%	30%	20%	20%	20%	30%	30%	30%	20%	20%	20%	30%	20%	10%	
	Frustration	4	20%	10%	20%	20%	20%	30%	30%	30%	40%	40%	40%	10%	30%	20%	20%	20%	40%	20%	20%	20%	40%	50%	30%	30%	30%	40%	
	Dispute	5	0%	0%	10%	10%	0%	10%	10%	0%	0%	0%	0%	0%	20%	10%	0%	10%	10%	20%	0%	10%	0%	10%	20%	0%	30%	10%	
PO10	Incompatibility	1	15%	30%	0%	20%	40%	30%	0%	40%	50%	20%	0%	10%	0%	30%	30%	40%	0%	0%	25%	10%	15%	15%	10%	10%	10%	10%	
	Disagreement	2	15%	20%	30%	30%	10%	40%	50%	20%	10%	10%	10%	10%	20%	20%	20%	10%	50%	50%	25%	10%	15%	15%	10%	50%	30%	30%	
	Antagonism	3	10%	25%	40%	30%	10%	15%	25%	10%	0%	30%	50%	40%	40%	20%	10%	25%	50%	50%	25%	40%	30%	25%	40%	20%	30%	30%	
	Frustration	4	60%	25%	30%	20%	40%	15%	25%	10%	40%	40%	40%	40%	40%	30%	40%	25%	0%	0%	25%	40%	30%	40%	40%	20%	30%	30%	
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	5%	0%	0%	0%	0%	

Respondent	Conflict Level		Time					Cost				Quality							Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D	
PO11	Incompatibility	1	30%	30%	5%	20%	20%	5%	5%	5%	5%	10%	10%	5%	5%	10%	5%	10%	5%	20%	20%	20%	20%	20%	20%	20%	30%	10%	5%
	Disagreement	2	30%	35%	60%	15%	10%	25%	10%	60%	45%	10%	30%	80%	5%	40%	15%	5%	5%	80%	30%	60%	30%	20%	30%	30%	50%	40%	15%
	Antagonism	3	40%	35%	15%	5%	70%	70%	40%	35%	50%	60%	60%	15%	10%	50%	80%	70%	20%	0%	50%	20%	40%	30%	50%	40%	40%	50%	
	Frustration	4	0%	0%	20%	60%	0%	0%	45%	0%	0%	20%	0%	0%	80%	0%	0%	15%	70%	0%	0%	0%	10%	20%	0%	0%	0%	30%	
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	
PO12	Incompatibility	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	10%	5%	10%	5%	20%	20%	20%	10%	0%	20%	30%	10%	5%	
	Disagreement	2	20%	40%	30%	30%	30%	20%	20%	30%	20%	20%	20%	10%	0%	40%	15%	5%	5%	80%	30%	60%	20%	20%	30%	30%	50%	15%	
	Antagonism	3	30%	20%	60%	30%	30%	40%	30%	50%	50%	30%	30%	50%	30%	50%	80%	70%	20%	0%	50%	20%	30%	30%	50%	40%	40%	50%	
	Frustration	4	50%	40%	0%	40%	30%	30%	40%	10%	30%	0%	40%	40%	40%	0%	0%	15%	70%	0%	0%	0%	30%	50%	0%	0%	0%	30%	
	Dispute	5	0%	0%	10%	0%	10%	10%	10%	10%	0%	0%	10%	0%	30%	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%	
PO13	Incompatibility	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	80%	0%	0%	0%	0%	50%	0%	0%	10%	5%	0%	0%	50%	0%	
	Disagreement	2	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	0%	0%	0%	0%	50%	0%	0%	30%	10%	0%	0%	50%	0%	
	Antagonism	3	50%	50%	0%	0%	0%	50%	50%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	40%	20%	20%	0%	0%	0%	
	Frustration	4	0%	50%	0%	20%	0%	50%	50%	20%	20%	50%	50%	50%	0%	20%	20%	0%	0%	0%	20%	0%	20%	50%	80%	0%	0%	50%	
	Dispute	5	0%	0%	100%	80%	100%	0%	0%	80%	80%	50%	0%	0%	0%	80%	80%	100%	100%	0%	80%	100%	0%	15%	0%	100%	0%	50%	
PO14	Incompatibility	1	0%	0%	0%	0%	0%	0%	50%	0%	0%	10%	0%	30%	0%	10%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	40%	40%	
	Disagreement	2	0%	60%	40%	30%	30%	40%	30%	30%	20%	30%	20%	50%	10%	30%	20%	20%	20%	20%	30%	10%	10%	20%	10%	20%	30%	30%	
	Antagonism	3	60%	20%	40%	20%	30%	30%	20%	30%	30%	40%	30%	20%	40%	30%	30%	30%	30%	30%	30%	40%	40%	40%	30%	20%	30%	30%	
	Frustration	4	30%	20%	20%	50%	40%	30%	0%	40%	50%	20%	50%	0%	50%	30%	50%	50%	50%	50%	40%	50%	30%	30%	60%	60%	0%	0%	
	Dispute	5	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	0%	0%	0%	0%	
PO15	Incompatibility	1	40%	50%	30%	40%	10%	20%	10%	5%	10%	10%	10%	5%	20%	15%	0%	10%	20%	10%	15%	5%	20%	10%	5%	25%	10%	5%	
	Disagreement	2	40%	50%	70%	40%	80%	80%	50%	70%	40%	40%	40%	80%	80%	15%	5%	50%	20%	40%	15%	30%	20%	10%	40%	25%	80%	25%	
	Antagonism	3	20%	0%	0%	20%	10%	0%	20%	25%	30%	30%	30%	15%	0%	20%	80%	30%	30%	30%	70%	30%	20%	20%	30%	40%	10%	30%	
	Frustration	4	0%	0%	0%	0%	0%	0%	20%	0%	20%	20%	20%	0%	0%	50%	15%	10%	30%	20%	0%	30%	30%	40%	25%	10%	0%	30%	
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	10%	20%	0%	0%	10%	

Respondent	Conflict Level		Time					Cost			Quality									Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D		
PO16	Incompatibility	1	30%	5%	0%	20%	10%	0%	0%	0%	0%	30%	0%	50%	0%	10%	0%	0%	80%	60%	0%	0%	10%	20%	30%	20%	40%	0%		
	Disagreement	2	30%	5%	0%	10%	10%	50%	10%	30%	30%	30%	0%	50%	20%	20%	40%	30%	20%	40%	0%	0%	20%	20%	10%	60%	40%	20%		
	Antagonism	3	15%	10%	30%	10%	40%	40%	20%	30%	20%	30%	20%	0%	30%	40%	20%	10%	0%	0%	60%	50%	30%	30%	50%	10%	0%	20%		
	Frustration	4	20%	50%	60%	55%	20%	0%	40%	20%	30%	10%	50%	0%	30%	30%	30%	50%	0%	0%	10%	10%	35%	20%	0%	0%	0%	20%		
	Dispute	5	5%	30%	10%	5%	20%	10%	30%	20%	20%	0%	30%	0%	20%	0%	10%	10%	0%	0%	30%	40%	5%	10%	10%	10%	20%	40%		
PO17	Incompatibility	1	30%	10%	10%	50%	10%	50%	0%	20%	20%	10%	10%	50%	50%	10%	30%	20%	60%	60%	10%	10%	20%	20%	30%	30%	70%	20%		
	Disagreement	2	40%	10%	30%	40%	20%	50%	30%	30%	30%	20%	20%	40%	40%	20%	30%	20%	40%	40%	10%	10%	40%	20%	30%	30%	30%	20%		
	Antagonism	3	20%	20%	30%	10%	60%	0%	30%	30%	30%	40%	30%	10%	10%	30%	30%	30%	0%	0%	40%	40%	20%	40%	30%	30%	0%	20%		
	Frustration	4	10%	20%	30%	0%	10%	0%	40%	20%	20%	20%	20%	0%	0%	30%	10%	20%	0%	0%	40%	40%	20%	20%	10%	10%	0%	20%		
	Dispute	5	0%	40%	0%	0%	0%	0%	0%	0%	0%	10%	20%	0%	0%	10%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%		
PO18	Incompatibility	1	30%	20%	40%	10%	0%	10%	10%	0%	10%	10%	30%	10%	10%	0%	10%	0%	10%	0%	0%	0%	30%	10%	20%	10%	20%	20%		
	Disagreement	2	30%	10%	40%	20%	10%	10%	10%	10%	10%	10%	30%	20%	20%	20%	10%	30%	30%	30%	0%	0%	30%	40%	20%	10%	30%	0%		
	Antagonism	3	10%	30%	10%	30%	10%	20%	20%	30%	30%	30%	20%	20%	30%	20%	30%	20%	10%	0%	30%	10%	10%	40%	10%	20%	10%	0%		
	Frustration	4	10%	30%	10%	40%	30%	30%	50%	30%	40%	30%	20%	30%	30%	30%	30%	30%	30%	50%	20%	30%	10%	10%	20%	30%	30%	30%		
	Dispute	5	20%	10%	0%	0%	50%	30%	10%	30%	10%	20%	0%	20%	10%	30%	20%	20%	20%	20%	50%	60%	20%	0%	30%	30%	10%	50%		
PO19	Incompatibility	1	20%	30%	20%	30%	20%	0%	20%	30%	30%	10%	20%	20%	30%	30%	30%	10%	30%	30%	30%	30%	20%	10%	30%	40%	40%	20%		
	Disagreement	2	30%	40%	30%	40%	30%	30%	30%	40%	40%	20%	30%	30%	40%	40%	40%	20%	40%	40%	30%	40%	30%	30%	30%	30%	20%	30%		
	Antagonism	3	40%	20%	40%	20%	40%	40%	20%	20%	30%	40%	30%	40%	20%	30%	20%	30%	30%	30%	30%	30%	30%	40%	30%	20%	30%	30%		
	Frustration	4	10%	10%	10%	10%	10%	30%	20%	10%	0%	30%	20%	10%	10%	0%	10%	30%	0%	0%	10%	0%	20%	20%	10%	10%	10%	20%		
	Dispute	5	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
PO20	Incompatibility	1	20%	0%	50%	0%	20%	50%	80%	80%	60%	0%	20%	20%	0%	0%	0%	0%	0%	0%	40%	50%	20%	20%	0%	0%	0%	0%		
	Disagreement	2	40%	0%	50%	20%	80%	20%	20%	20%	30%	30%	50%	30%	0%	20%	0%	20%	10%	0%	30%	30%	20%	20%	0%	0%	50%	10%		
	Antagonism	3	40%	25%	0%	50%	0%	30%	0%	0%	10%	40%	30%	50%	20%	50%	10%	0%	40%	20%	30%	20%	20%	30%	50%	50%	20%	40%		
	Frustration	4	0%	75%	0%	30%	0%	0%	0%	0%	0%	30%	0%	0%	30%	30%	40%	50%	50%	30%	0%	0%	40%	30%	50%	30%	20%	50%		
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	30%	0%	50%	0%	0%	0%	0%	0%	20%	10%	0%		

Respondent	Conflict Level		Time					Cost		Quality									Safety		Scope					Personnel & others				
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D		
PO21	Incompatibility	1	100%	80%	50%	0%	0%	100%	95%	10%	10%	80%	90%	50%	0%	90%	90%	90%	90%	90%	0%	0%	10%	20%	90%	90%	0%	90%		
	Disagreement	2	0%	20%	50%	70%	90%	0%	5%	90%	90%	20%	10%	50%	70%	10%	10%	10%	10%	10%	0%	70%	10%	20%	10%	10%	50%	10%		
	Antagonism	3	0%	0%	0%	30%	10%	0%	0%	0%	0%	0%	0%	0%	30%	0%	0%	0%	0%	0%	0%	0%	80%	30%	20%	20%	0%	0%	50%	0%
	Frustration	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	0%	50%	40%	0%	0%	0%	0%
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%
PO22	Incompatibility	1	30%	0%	0%	30%	50%	0%	0%	0%	0%	20%	0%	0%	50%	30%	30%	30%	10%	10%	30%	0%	20%	10%	10%	10%	0%	40%		
	Disagreement	2	0%	0%	0%	20%	0%	0%	0%	0%	0%	30%	0%	0%	0%	0%	20%	40%	0%	20%	30%	0%	20%	10%	30%	20%	30%	60%		
	Antagonism	3	30%	20%	0%	0%	0%	30%	0%	30%	0%	10%	50%	20%	0%	30%	0%	0%	30%	30%	0%	0%	30%	30%	40%	30%	10%	0%		
	Frustration	4	20%	50%	50%	0%	0%	40%	60%	40%	70%	20%	40%	30%	0%	0%	0%	0%	30%	20%	40%	40%	20%	40%	10%	20%	20%	0%		
	Dispute	5	20%	30%	50%	50%	50%	30%	40%	30%	30%	20%	10%	50%	50%	40%	50%	30%	30%	20%	0%	60%	10%	10%	10%	20%	40%	0%		
PO23	Incompatibility	1	80%	40%	0%	0%	10%	30%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	30%	30%	10%	0%	30%	0%	50%		
	Disagreement	2	0%	0%	0%	0%	40%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	40%	30%	10%	0%	40%	0%	50%		
	Antagonism	3	0%	60%	10%	30%	0%	0%	50%	60%	0%	70%	20%	80%	0%	40%	80%	0%	40%	50%	80%	30%	30%	20%	0%	30%	0%	0%		
	Frustration	4	0%	0%	30%	20%	10%	20%	20%	0%	40%	0%	40%	0%	70%	60%	0%	80%	60%	0%	20%	0%	10%	50%	50%	0%	50%	0%		
	Dispute	5	10%	0%	60%	50%	40%	10%	30%	40%	60%	30%	40%	20%	30%	0%	20%	20%	0%	0%	0%	0%	0%	10%	50%	0%	50%	0%		
PO24	Incompatibility	1	10%	0%	15%	20%	20%	5%	10%	10%	20%	30%	10%	####	10%	0%	100%	0%	0%	0%	0%	20%	10%	10%	50%	60%	70%	90%		
	Disagreement	2	20%	20%	20%	20%	20%	20%	70%	80%	70%	40%	30%	0%	10%	100%	0%	0%	0%	0%	100%	10%	10%	20%	25%	20%	30%	10%		
	Antagonism	3	10%	0%	20%	10%	20%	25%	20%	10%	10%	20%	20%	0%	20%	0%	0%	0%	0%	50%	0%	40%	40%	30%	25%	10%	0%	0%		
	Frustration	4	30%	40%	35%	40%	20%	30%	0%	0%	0%	10%	40%	0%	60%	0%	0%	100%	100%	50%	0%	30%	40%	40%	0%	10%	0%	0%		
	Dispute	5	30%	40%	10%	10%	20%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
C1	Incompatibility	1	15%	10%	10%	10%	20%	20%	20%	15%	15%	15%	15%	10%	20%	30%	10%	20%	20%	20%	10%	20%	20%	10%	10%	20%	20%	10%		
	Disagreement	2	25%	20%	20%	40%	20%	30%	20%	20%	25%	20%	15%	40%	30%	20%	30%	20%	20%	20%	90%	40%	20%	30%	30%	20%	20%	20%		
	Antagonism	3	30%	20%	40%	30%	20%	20%	20%	25%	20%	30%	30%	30%	30%	20%	20%	30%	20%	30%	0%	20%	30%	50%	30%	30%	20%	20%		
	Frustration	4	30%	30%	20%	20%	20%	30%	30%	20%	30%	30%	25%	20%	20%	30%	30%	20%	40%	30%	0%	20%	30%	10%	30%	20%	40%	30%		
	Dispute	5	0%	20%	10%	0%	20%	0%	10%	20%	10%	5%	15%	0%	0%	0%	10%	10%	0%	0%	0%	0%	0%	0%	0%	10%	0%	20%		

Respondent	Conflict Level		Time					Cost			Quality									Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D		
C2	Incompatibility	1	10%	10%	10%	30%	20%	20%	20%	20%	20%	10%	10%	10%	30%	30%	20%	20%	30%	30%	30%	30%	20%	10%	15%	15%	30%	15%		
	Disagreement	2	20%	10%	15%	30%	20%	20%	20%	20%	20%	25%	25%	25%	20%	20%	20%	20%	20%	20%	30%	30%	20%	40%	15%	15%	30%	25%		
	Antagonism	3	20%	20%	25%	20%	20%	20%	20%	20%	20%	25%	25%	25%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	30%	30%	20%	20%		
	Frustration	4	40%	40%	40%	20%	35%	35%	35%	30%	30%	35%	35%	35%	30%	30%	30%	30%	30%	30%	20%	20%	20%	20%	35%	35%	20%	30%		
	Dispute	5	10%	20%	10%	0%	5%	5%	5%	10%	10%	5%	5%	5%	0%	0%	10%	10%	0%	0%	0%	0%	10%	0%	5%	5%	0%	10%		
C3	Incompatibility	1	20%	20%	20%	30%	15%	20%	20%	20%	20%	15%	20%	20%	20%	20%	20%	20%	10%	10%	20%	20%	20%	40%	20%	20%	20%	20%		
	Disagreement	2	20%	20%	20%	30%	15%	20%	20%	20%	20%	15%	20%	30%	30%	30%	20%	20%	30%	30%	20%	20%	20%	20%	20%	20%	20%	20%		
	Antagonism	3	30%	30%	20%	10%	15%	20%	20%	20%	20%	15%	20%	20%	20%	20%	20%	20%	30%	30%	20%	20%	20%	20%	20%	20%	35%	35%		
	Frustration	4	20%	30%	30%	30%	45%	30%	30%	35%	40%	45%	30%	30%	30%	30%	40%	40%	30%	30%	35%	35%	40%	20%	30%	30%	25%	25%		
	Dispute	5	10%	0%	10%	0%	10%	10%	10%	5%	0%	10%	10%	0%	0%	0%	0%	0%	0%	0%	5%	5%	0%	0%	10%	10%	0%	0%		
C4	Incompatibility	1	20%	10%	20%	20%	10%	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	40%	20%		
	Disagreement	2	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%		
	Antagonism	3	20%	20%	20%	20%	20%	30%	30%	30%	20%	20%	20%	20%	20%	15%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	20%	20%		
	Frustration	4	40%	40%	40%	40%	40%	40%	30%	30%	40%	20%	20%	40%	40%	35%	40%	30%	40%	40%	30%	20%	30%	30%	40%	30%	20%	20%		
	Dispute	5	0%	10%	0%	0%	10%	0%	0%	0%	0%	20%	20%	0%	0%	5%	5%	10%	0%	0%	10%	20%	10%	0%	0%	10%	0%	20%		
C5	Incompatibility	1	10%	20%	20%	30%	20%	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%	20%	30%	30%	20%	20%	20%	20%	15%	20%	30%	10%		
	Disagreement	2	20%	20%	20%	20%	20%	20%	20%	25%	15%	15%	15%	20%	20%	20%	20%	20%	30%	30%	20%	20%	20%	20%	15%	20%	30%	20%		
	Antagonism	3	20%	10%	30%	30%	30%	20%	20%	30%	20%	20%	20%	30%	20%	20%	15%	20%	20%	20%	20%	20%	30%	30%	20%	30%	20%	20%		
	Frustration	4	30%	50%	30%	20%	30%	20%	30%	30%	40%	40%	40%	30%	30%	30%	40%	40%	20%	20%	40%	40%	30%	30%	45%	30%	20%	40%		
	Dispute	5	20%	0%	0%	0%	0%	20%	10%	0%	10%	10%	10%	0%	10%	10%	10%	5%	0%	0%	0%	0%	0%	0%	5%	0%	0%	10%		
C6	Incompatibility	1	30%	20%	10%	20%	20%	20%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	10%	20%	20%		
	Disagreement	2	30%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	20%	20%	20%	20%	20%	20%	20%	20%		
	Antagonism	3	10%	20%	30%	30%	20%	20%	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	20%	30%	30%	25%	30%	20%		
	Frustration	4	30%	30%	40%	30%	30%	30%	30%	20%	30%	40%	40%	40%	40%	30%	30%	30%	30%	30%	30%	30%	40%	30%	30%	45%	30%	30%		
	Dispute	5	0%	0%	0%	0%	10%	10%	10%	20%	10%	0%	0%	0%	10%	10%	10%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%	10%		

Respondent	Conflict Level		Time					Cost				Quality							Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D	
C7	Incompatibility	1	20%	30%	10%	30%	20%	50%	10%	15%	20%	60%	100%	40%	40%	40%	90%	80%	80%	50%	30%	30%	30%	30%	50%	30%	30%	30%	
	Disagreement	2	30%	70%	20%	60%	20%	50%	20%	20%	20%	40%	0%	40%	40%	40%	10%	20%	20%	40%	30%	30%	20%	30%	50%	30%	40%	20%	
	Antagonism	3	30%	0%	30%	10%	20%	0%	20%	15%	40%	0%	0%	10%	10%	10%	0%	0%	0%	10%	30%	30%	30%	20%	0%	40%	30%	50%	
	Frustration	4	20%	0%	40%	0%	40%	0%	50%	50%	20%	0%	0%	10%	10%	10%	0%	0%	0%	0%	10%	10%	20%	20%	0%	0%	0%	0%	
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
C8	Incompatibility	1	30%	30%	10%	60%	10%	60%	10%	30%	40%	70%	50%	50%	25%	25%	40%	40%	60%	60%	15%	15%	20%	10%	30%	50%	60%	15%	
	Disagreement	2	30%	30%	20%	20%	20%	30%	20%	30%	20%	30%	25%	25%	25%	25%	20%	40%	40%	40%	15%	15%	10%	10%	30%	25%	20%	15%	
	Antagonism	3	20%	20%	30%	20%	30%	10%	20%	30%	20%	0%	25%	25%	25%	25%	40%	20%	0%	0%	30%	15%	20%	30%	40%	25%	20%	25%	
	Frustration	4	20%	20%	40%	0%	40%	0%	45%	10%	20%	0%	0%	0%	25%	25%	0%	0%	0%	0%	40%	50%	40%	50%	0%	0%	0%	40%	
	Dispute	5	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	10%	0%	0%	0%	0%	0%	5%
C9	Incompatibility	1	20%	20%	10%	80%	30%	10%	10%	30%	10%	70%	70%	70%	70%	60%	40%	40%	40%	40%	30%	30%	20%	10%	40%	40%	80%	40%	
	Disagreement	2	20%	30%	30%	10%	20%	10%	10%	30%	10%	10%	10%	10%	10%	20%	20%	20%	20%	20%	20%	20%	30%	10%	20%	20%	20%	15%	
	Antagonism	3	30%	40%	30%	10%	30%	10%	10%	30%	30%	10%	10%	10%	10%	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	0%	15%	
	Frustration	4	30%	10%	30%	0%	20%	50%	50%	10%	40%	10%	10%	10%	10%	10%	20%	20%	20%	20%	30%	30%	30%	50%	10%	10%	0%	15%	
	Dispute	5	0%	0%	0%	0%	0%	20%	20%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	10%	0%	15%	
C10	Incompatibility	1	20%	20%	25%	20%	20%	25%	25%	20%	20%	10%	20%	20%	20%	20%	20%	20%	20%	15%	15%	25%	10%	20%	25%	25%	25%	25%	
	Disagreement	2	20%	20%	25%	20%	20%	25%	25%	20%	20%	20%	15%	15%	15%	10%	20%	20%	20%	15%	15%	25%	20%	20%	25%	25%	25%	25%	
	Antagonism	3	20%	20%	15%	20%	20%	15%	15%	20%	20%	20%	25%	25%	25%	10%	20%	20%	20%	25%	25%	15%	30%	30%	15%	15%	15%	15%	
	Frustration	4	40%	35%	30%	30%	30%	30%	30%	40%	40%	50%	30%	30%	30%	50%	30%	35%	35%	40%	40%	35%	30%	30%	35%	35%	35%	35%	
	Dispute	5	0%	5%	5%	10%	10%	5%	5%	0%	0%	0%	10%	10%	10%	10%	10%	5%	5%	5%	5%	0%	10%	0%	0%	0%	0%	0%	
C11	Incompatibility	1	15%	15%	30%	50%	30%	30%	10%	20%	20%	20%	20%	30%	30%	20%	20%	20%	30%	30%	30%	10%	20%	30%	10%	10%	30%	20%	
	Disagreement	2	15%	15%	15%	50%	20%	30%	10%	20%	20%	20%	20%	30%	30%	20%	20%	20%	30%	30%	30%	20%	30%	20%	20%	20%	40%	20%	
	Antagonism	3	30%	30%	15%	0%	20%	10%	30%	20%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	20%	30%	30%	30%	20%	20%	30%	20%	
	Frustration	4	30%	30%	30%	0%	30%	30%	50%	30%	30%	30%	30%	20%	20%	30%	30%	30%	20%	20%	20%	30%	10%	20%	35%	35%	0%	30%	
	Dispute	5	10%	10%	10%	0%	0%	0%	0%	10%	10%	10%	10%	0%	0%	10%	10%	0%	0%	0%	0%	10%	10%	0%	15%	15%	0%	10%	

Respondent	Conflict Level		Time					Cost				Quality							Safety				Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D			
C12	Incompatibility	1	15%	5%	20%	40%	20%	15%	15%	15%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	10%	15%	20%	30%	30%			
	Disagreement	2	15%	25%	20%	20%	20%	25%	20%	20%	20%	20%	20%	20%	20%	25%	20%	20%	20%	30%	20%	20%	20%	20%	15%	20%	30%	25%			
	Antagonism	3	20%	20%	20%	20%	20%	20%	15%	15%	30%	20%	20%	20%	20%	25%	20%	30%	30%	20%	30%	30%	30%	20%	20%	30%	25%				
	Frustration	4	40%	50%	40%	20%	40%	40%	40%	40%	30%	30%	30%	20%	35%	35%	30%	40%	30%	30%	20%	30%	30%	40%	40%	30%	10%	20%			
	Dispute	5	10%	0%	0%	0%	0%	0%	10%	10%	0%	10%	10%	0%	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	0%	0%			
C13	Incompatibility	1	40%	10%	30%	30%	25%	20%	30%	5%	20%	10%	20%	20%	15%	40%	10%	10%	20%	20%	40%	20%	20%	10%	10%	10%	10%				
	Disagreement	2	10%	30%	20%	20%	20%	20%	20%	25%	25%	30%	20%	20%	25%	20%	10%	30%	30%	20%	20%	10%	30%	10%	20%	20%	40%	10%			
	Antagonism	3	20%	25%	15%	10%	30%	20%	15%	25%	25%	25%	20%	20%	25%	20%	25%	20%	20%	20%	25%	30%	20%	30%	20%	25%	30%				
	Frustration	4	30%	25%	25%	30%	25%	35%	30%	30%	30%	25%	30%	35%	25%	35%	30%	25%	35%	40%	30%	25%	20%	50%	30%	35%	25%	40%			
	Dispute	5	0%	10%	10%	10%	0%	5%	5%	15%	0%	10%	10%	5%	10%	5%	0%	10%	5%	0%	10%	0%	0%	0%	10%	15%	0%	10%			
C14	Incompatibility	1	30%	30%	10%	80%	15%	60%	10%	20%	60%	60%	50%	50%	10%	10%	20%	80%	60%	60%	15%	15%	10%	10%	40%	20%	40%	25%			
	Disagreement	2	30%	30%	20%	10%	15%	10%	20%	20%	40%	40%	20%	50%	20%	20%	20%	10%	20%	20%	15%	15%	10%	20%	40%	20%	40%	15%			
	Antagonism	3	20%	20%	20%	10%	15%	10%	30%	20%	0%	0%	30%	0%	20%	20%	30%	10%	20%	20%	20%	40%	40%	10%	20%	10%	15%				
	Frustration	4	20%	20%	50%	0%	50%	20%	40%	40%	0%	0%	0%	0%	50%	50%	30%	0%	0%	0%	40%	40%	30%	30%	10%	40%	10%	40%			
	Dispute	5	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	10%	0%	0%	0%	0%	5%			
C15	Incompatibility	1	20%	20%	30%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	30%	30%	20%	10%	30%	30%	30%	10%			
	Disagreement	2	20%	20%	20%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	20%	20%	10%	20%	20%	30%	15%			
	Antagonism	3	30%	20%	20%	30%	20%	30%	20%	20%	20%	20%	20%	30%	20%	20%	20%	20%	20%	30%	15%	15%	20%	20%	15%	20%	20%	15%			
	Frustration	4	30%	30%	30%	10%	40%	30%	30%	30%	35%	35%	35%	30%	35%	35%	35%	35%	20%	20%	30%	30%	30%	40%	30%	25%	20%	50%			
	Dispute	5	0%	10%	0%	0%	0%	0%	10%	10%	5%	5%	5%	0%	5%	5%	5%	5%	0%	0%	5%	5%	10%	20%	5%	5%	0%	10%			
C16	Incompatibility	1	15%	5%	20%	15%	10%	20%	20%	15%	15%	20%	20%	25%	20%	10%	25%	20%	20%	20%	15%	20%	20%	20%	20%	20%	30%	20%			
	Disagreement	2	20%	20%	20%	15%	20%	20%	20%	20%	20%	20%	15%	25%	25%	30%	25%	20%	20%	20%	15%	30%	20%	20%	20%	20%	30%	20%			
	Antagonism	3	15%	70%	20%	50%	20%	25%	25%	15%	15%	20%	30%	25%	25%	30%	25%	20%	30%	30%	30%	20%	30%	30%	20%	20%	10%	20%			
	Frustration	4	40%	5%	35%	20%	40%	30%	30%	30%	30%	30%	30%	25%	30%	30%	25%	30%	25%	30%	35%	30%	30%	20%	30%	20%	30%	20%			
	Dispute	5	10%	0%	5%	0%	10%	5%	5%	20%	20%	10%	5%	0%	0%	0%	10%	5%	0%	5%	0%	0%	10%	10%	20%	0%	20%				

Respondent	Conflict Level		Time					Cost		Quality									Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D	
C17	Incompatibility	1	20%	20%	30%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	30%	30%	20%	20%	30%	30%	30%	10%	
	Disagreement	2	20%	20%	20%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	10%	20%	20%	30%	20%	20%	20%	30%	15%	
	Antagonism	3	30%	20%	20%	30%	20%	30%	20%	20%	20%	20%	20%	30%	20%	20%	20%	20%	20%	30%	15%	15%	20%	40%	15%	20%	20%	15%	
	Frustration	4	30%	30%	30%	10%	40%	30%	30%	30%	35%	35%	35%	30%	35%	35%	35%	35%	20%	30%	30%	30%	30%	20%	30%	25%	20%	50%	
	Dispute	5	0%	10%	0%	0%	0%	0%	10%	10%	5%	5%	5%	0%	5%	5%	5%	5%	0%	0%	5%	5%	0%	0%	5%	5%	0%	10%	
C18	Incompatibility	1	20%	20%	20%	20%	15%	20%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	20%	20%	20%	20%	30%	20%	10%	10%	30%	20%	
	Disagreement	2	20%	20%	20%	30%	25%	20%	20%	20%	20%	20%	20%	20%	20%	10%	20%	20%	20%	20%	20%	30%	30%	40%	30%	30%	30%	20%	
	Antagonism	3	30%	20%	20%	20%	30%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	20%	20%	20%	20%	10%	30%	30%	30%	20%	20%		
	Frustration	4	30%	30%	35%	30%	30%	30%	30%	35%	35%	35%	40%	40%	40%	20%	20%	40%	40%	30%	30%	10%	10%	30%	30%	20%	20%		
	Dispute	5	0%	10%	5%	0%	0%	10%	10%	5%	5%	5%	0%	0%	0%	10%	10%	0%	0%	10%	0%	20%	0%	0%	0%	0%	0%	20%	
C19	Incompatibility	1	15%	20%	20%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	10%	30%	50%	15%	
	Disagreement	2	20%	20%	30%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	10%	30%	10%	15%		
	Antagonism	3	20%	20%	20%	20%	15%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	20%	20%	20%	30%	30%	40%	30%	10%	40%	30%		
	Frustration	4	30%	30%	30%	30%	35%	30%	35%	35%	40%	40%	30%	40%	40%	30%	35%	35%	40%	40%	35%	20%	20%	10%	40%	30%	0%	30%	
	Dispute	5	15%	10%	0%	0%	10%	10%	5%	5%	0%	0%	10%	0%	0%	0%	5%	5%	0%	0%	5%	0%	0%	0%	10%	0%	0%	10%	
C20	Incompatibility	1	20%	10%	20%	30%	12%	10%	10%	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	20%	20%	20%	10%	10%	30%	20%	
	Disagreement	2	30%	20%	20%	30%	18%	12%	12%	20%	20%	25%	25%	25%	25%	25%	20%	20%	20%	20%	30%	20%	20%	20%	30%	30%	30%	10%	
	Antagonism	3	30%	30%	20%	20%	20%	18%	18%	20%	20%	25%	25%	25%	25%	25%	25%	25%	25%	25%	20%	30%	20%	30%	30%	30%	30%	30%	
	Frustration	4	20%	30%	40%	20%	45%	50%	50%	40%	35%	25%	25%	25%	25%	25%	35%	30%	30%	35%	20%	30%	40%	30%	30%	30%	10%	30%	
	Dispute	5	0%	10%	0%	0%	5%	10%	10%	10%	5%	5%	5%	5%	5%	5%	0%	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	10%	
C21	Incompatibility	1	80%	80%	20%	70%	10%	20%	70%	20%	10%	100%	100%	70%	80%	80%	80%	100%	60%	80%	80%	60%	20%	10%	100%	100%	100%	100%	
	Disagreement	2	20%	20%	20%	30%	10%	20%	30%	20%	20%	0%	0%	20%	10%	20%	20%	0%	20%	20%	20%	20%	10%	20%	0%	0%	0%	0%	
	Antagonism	3	0%	0%	60%	0%	80%	60%	0%	50%	60%	0%	0%	10%	10%	0%	0%	0%	20%	0%	0%	20%	20%	30%	0%	0%	0%	0%	
	Frustration	4	0%	0%	0%	0%	0%	0%	0%	10%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	40%	0%	0%	0%	0%	
	Dispute	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

Respondent	Conflict Level		Time					Cost		Quality									Safety		Scope					Personnel & others			
			1A	1B	1C	1D	1E	2A	2B	3A	3B	3C	3D	3E	3F	3G	3H	3I	4A	4B	5A	5B	5C	5D	6A	6B	6C	6D	
C22	Incompatibility	1	60%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	50%	0%	0%	60%	70%	20%	10%	0%	0%	90%	90%	
	Disagreement	2	0%	50%	50%	50%	70%	0%	0%	0%	0%	0%	0%	70%	0%	60%	0%	50%	50%	0%	40%	30%	20%	20%	0%	0%	10%	10%	
	Antagonism	3	40%	50%	50%	50%	30%	50%	0%	0%	0%	0%	50%	30%	0%	40%	50%	0%	50%	0%	0%	0%	30%	30%	50%	50%	0%	0%	
	Frustration	4	0%	0%	0%	0%	0%	50%	50%	50%	50%	50%	50%	0%	50%	0%	50%	0%	0%	0%	0%	0%	30%	30%	50%	50%	0%	0%	
	Dispute	5	0%	0%	0%	0%	0%	0%	50%	50%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	10%	0%	0%	0%	0%	
C23	Incompatibility	1	40%	40%	30%	30%	20%	20%	20%	20%	20%	20%	30%	20%	10%	40%	20%	30%	10%	10%	10%	30%	10%	10%	20%	30%	20%	20%	
	Disagreement	2	30%	50%	30%	30%	30%	10%	30%	30%	30%	50%	30%	20%	30%	10%	30%	20%	30%	30%	0%	0%	30%	20%	30%	30%	30%	30%	
	Antagonism	3	30%	10%	30%	10%	30%	10%	10%	10%	10%	20%	40%	10%	10%	20%	20%	20%	30%	50%	20%	30%	40%	20%	30%	40%	10%	20%	
	Frustration	4	0%	0%	10%	20%	10%	20%	30%	30%	20%	10%	10%	20%	20%	30%	10%	30%	10%	10%	40%	30%	0%	40%	30%	10%	20%	20%	
	Dispute	5	0%	0%	0%	10%	10%	40%	10%	10%	20%	0%	0%	20%	20%	30%	0%	10%	0%	0%	30%	30%	0%	10%	0%	0%	10%	10%	
C24	Incompatibility	1	25%	10%	30%	20%	10%	30%	30%	40%	50%	20%	30%	50%	50%	20%	30%	10%	50%	10%	40%	50%	10%	10%	60%	60%	10%	20%	
	Disagreement	2	20%	30%	30%	50%	30%	20%	30%	30%	30%	50%	40%	40%	30%	30%	40%	20%	20%	20%	40%	30%	30%	10%	20%	10%	20%	20%	
	Antagonism	3	40%	20%	20%	30%	40%	50%	40%	20%	20%	20%	20%	10%	10%	40%	20%	30%	10%	30%	5%	10%	60%	30%	10%	10%	20%	20%	
	Frustration	4	10%	40%	10%	0%	20%	0%	0%	10%	0%	10%	10%	0%	10%	10%	5%	40%	10%	20%	10%	10%	0%	40%	5%	10%	20%	20%	
	Dispute	5	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	10%	20%	5%	0%	0%	10%	5%	10%	30%	20%		
C25	Incompatibility	1	20%	20%	30%	40%	30%	25%	25%	10%	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	10%	20%	20%	15%	30%	10%	
	Disagreement	2	20%	20%	15%	20%	25%	25%	25%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	15%	15%	20%	20%	20%	15%	30%	20%	
	Antagonism	3	20%	20%	15%	20%	25%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	30%	30%	15%	15%	30%	30%	30%	30%	20%	20%	
	Frustration	4	30%	30%	35%	20%	20%	30%	30%	40%	35%	30%	30%	40%	35%	35%	35%	35%	30%	30%	40%	45%	40%	30%	30%	35%	20%	40%	
	Dispute	5	10%	10%	5%	0%	0%	0%	0%	10%	15%	10%	10%	0%	5%	5%	5%	5%	0%	0%	10%	5%	0%	0%	0%	5%	0%	10%	

Appendix C.3: Analysis Results of Conflict Levels

Public Owner	A1	B1	C1	D1	E1	A2	B2	A3	B3	C3	D3	E3	F3	G3	H3	I3	A4	B4	A5	B5	C5	D5	A6	B6	C6	D6
PO1	2.60	2.40	1.70	3.10	2.70	2.50	1.60	2.40	2.30	2.40	2.30	2.30	2.10	1.90	2.60	2.30	2.60	2.60	2.90	2.60	2.80	2.60	3.00	3.10	2.90	2.20
PO2	1.90	3.70	3.80	3.80	3.60	3.30	4.20	2.30	2.20	3.80	3.70	2.60	3.70	3.80	3.10	3.50	3.00	2.60	2.00	2.00	2.80	2.60	2.30	3.80	3.00	1.80
PO3	4.50	4.50	2.50	3.80	3.60	3.30	4.20	2.30	2.20	3.80	3.70	2.60	3.70	3.80	3.10	3.50	3.00	2.60	2.00	2.00	3.30	2.10	2.30	3.80	3.00	1.80
PO4	2.20	2.10	2.50	2.50	3.10	2.90	3.00	2.70	3.10	2.40	2.50	2.50	3.00	2.80	2.40	2.80	2.30	2.30	2.70	3.00	3.10	2.80	2.70	2.40	2.90	2.40
PO5	2.70	3.40	2.70	2.50	2.80	3.00	2.55	2.90	2.50	3.00	3.30	2.50	2.80	3.05	2.70	3.00	3.00	3.00	2.70	3.00	2.70	2.70	2.80	3.00	2.80	2.85
PO6	1.80	2.40	1.50	1.50	1.50	2.00	2.50	1.30	1.30	3.00	2.50	2.60	3.00	2.50	2.50	2.60	1.40	1.40	1.50	1.50	3.10	3.30	1.00	2.60	1.00	1.50
PO7	3.50	3.70	2.50	4.10	3.50	3.70	2.50	2.90	3.50	3.60	3.50	2.90	3.50	2.50	3.50	3.10	2.50	3.50	3.00	2.50	3.20	3.10	3.50	3.50	2.90	2.80
PO8	3.50	3.10	3.10	3.20	3.00	2.70	3.40	2.90	3.20	3.10	3.50	3.10	2.90	2.90	3.10	3.30	2.90	3.00	3.10	2.80	3.40	3.20	3.50	3.50	3.60	2.70
PO9	2.30	2.30	2.80	2.80	2.40	3.20	2.90	2.60	2.60	2.90	2.90	2.30	3.40	2.90	2.30	2.50	3.20	3.20	2.50	2.80	2.90	3.40	3.30	2.70	3.60	3.10
PO10	3.15	2.45	3.00	2.50	2.50	2.15	2.75	2.50	2.30	2.90	3.30	3.10	3.20	2.50	2.60	2.35	2.50	2.50	2.50	3.10	3.05	3.05	3.10	2.50	2.80	2.80
PO11	2.10	2.05	2.50	3.05	2.50	2.65	3.25	2.30	2.45	2.90	2.50	2.10	3.65	2.40	2.75	2.90	3.55	1.80	2.30	2.00	2.40	2.80	2.30	2.10	2.30	3.05
PO12	3.30	3.00	2.90	3.10	3.20	3.30	3.40	3.00	3.10	1.80	3.40	3.30	4.00	2.40	2.75	2.90	3.55	1.80	2.30	2.00	3.10	3.30	2.30	2.10	2.30	3.05
PO13	2.50	3.50	5.00	4.80	5.00	3.50	3.50	4.80	4.80	4.50	3.50	3.50	1.20	4.80	4.80	5.00	5.00	1.50	4.80	5.00	2.70	3.60	3.80	5.00	1.50	4.50
PO14	3.50	2.60	2.80	3.20	3.10	2.90	1.70	3.10	3.30	2.70	3.30	1.90	3.40	2.80	3.30	3.30	3.30	3.30	3.10	3.40	3.20	3.30	3.50	3.40	1.90	1.90
PO15	1.80	1.50	1.70	1.80	2.00	1.80	2.50	2.20	2.60	2.60	2.60	2.10	1.80	3.05	3.10	2.40	2.70	2.60	2.55	3.00	2.90	3.50	2.75	2.35	2.00	3.15
PO16	2.40	3.95	3.80	3.15	3.30	2.70	3.90	3.30	3.40	2.20	4.10	1.50	3.50	2.90	3.10	3.40	1.20	1.40	3.70	3.90	3.05	2.80	2.50	2.20	2.20	3.80
PO17	2.10	3.70	2.80	1.60	2.70	1.50	3.10	2.50	2.50	3.00	3.20	1.60	1.60	3.10	2.20	2.80	1.40	1.40	3.10	3.10	2.40	2.60	2.20	2.20	1.30	3.00
PO18	2.60	3.00	1.90	3.00	4.20	3.60	3.40	3.80	3.30	3.40	2.30	3.30	3.10	3.70	3.40	3.40	3.20	3.60	4.20	4.50	2.60	2.50	3.20	3.60	2.80	3.90
PO19	2.40	2.10	2.40	2.10	2.40	3.00	2.70	2.10	2.00	2.90	2.50	2.40	2.10	2.00	2.10	3.10	2.00	2.00	2.20	2.00	2.50	2.70	2.20	2.00	2.10	2.50
PO20	2.20	3.75	1.50	3.10	1.80	1.80	1.20	1.20	1.50	3.00	2.10	2.30	4.30	3.10	4.40	3.90	3.40	4.30	1.90	1.70	2.80	2.70	3.50	3.70	2.90	3.40
PO21	1.00	1.20	1.50	2.30	2.10	1.00	1.05	1.90	1.90	1.20	1.10	1.50	2.30	1.10	1.10	1.10	1.10	1.10	3.20	2.30	3.40	2.80	1.10	1.10	2.50	1.10
PO22	3.00	4.10	4.50	3.20	3.00	4.00	4.40	4.00	4.30	2.90	3.60	4.30	3.00	3.20	3.20	2.60	3.70	3.20	2.50	4.60	2.80	3.30	2.80	3.20	3.70	1.60
PO23	1.30	2.20	4.50	4.20	3.30	2.40	3.80	3.80	4.60	3.60	4.20	3.40	4.30	3.60	3.40	4.20	3.60	2.50	3.20	2.00	2.20	3.40	4.50	2.00	4.50	1.50
PO24	3.50	4.00	3.05	3.00	3.00	3.40	2.10	2.00	1.90	2.10	2.90	1.00	3.30	2.00	1.00	4.00	4.00	3.50	2.00	2.80	3.10	3.00	1.75	1.70	1.30	1.10

Contractor	A1	B1	C1	D1	E1	A2	B2	A3	B3	C3	D3	E3	F3	G3	H3	I3	A4	B4	A5	B5	C5	D5	A6	B6	C6	D6
C1	2.75	3.30	3.00	2.60	3.00	2.60	2.90	3.10	2.95	2.90	3.10	2.60	2.50	2.50	3.00	2.80	2.80	2.70	1.90	2.40	3.00	2.60	2.80	2.80	2.80	3.30
C2	3.20	3.50	3.25	2.30	2.85	2.85	2.85	2.90	2.90	3.00	3.00	3.00	2.50	2.50	2.90	2.90	2.50	2.50	2.30	2.30	2.90	2.60	3.00	3.00	2.30	2.95
C3	2.80	2.70	2.90	2.40	3.20	2.90	2.90	2.85	2.80	2.70	2.90	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.85	2.85	2.80	2.20	2.90	2.90	2.65	2.65
C4	2.80	3.20	2.80	2.80	3.20	3.00	2.70	2.70	2.80	3.00	3.00	2.80	2.80	2.85	2.90	2.90	2.80	2.80	2.90	3.00	2.90	2.70	2.80	2.90	2.20	3.00
C5	3.30	2.90	2.70	2.40	2.70	3.00	2.90	2.75	3.15	3.20	3.15	2.70	2.90	2.90	2.90	2.90	2.30	2.30	2.80	2.80	2.90	2.70	3.10	2.70	2.30	3.20
C6	2.40	2.60	3.00	2.70	2.90	2.90	2.70	3.00	2.90	2.80	2.80	2.80	2.80	2.90	2.90	2.90	2.60	2.60	2.90	2.70	2.90	2.70	2.70	3.05	2.70	2.90
C7	2.50	1.70	3.00	1.80	2.80	1.50	3.10	3.00	2.60	1.40	1.00	1.90	1.90	1.90	1.10	1.20	1.20	1.60	2.20	2.20	1.10	2.30	2.50	2.10	2.00	2.20
C8	2.30	2.30	3.00	1.60	3.00	1.50	3.15	2.20	2.20	1.30	1.75	1.75	2.50	2.50	2.00	1.80	1.40	1.40	2.95	3.15	2.00	3.20	2.10	1.75	1.60	3.05
C9	2.70	2.40	2.80	1.30	2.40	3.60	3.60	2.20	3.30	1.60	1.60	1.60	1.60	1.70	2.20	2.20	2.20	2.20	2.50	2.50	2.20	3.40	2.30	2.30	1.20	2.50
C10	2.80	2.85	2.65	2.90	2.90	2.65	2.65	2.80	2.80	3.10	2.95	2.95	2.95	3.20	2.90	2.85	2.85	3.05	3.05	2.60	2.90	2.70	2.60	2.60	2.60	2.60
C11	3.05	3.05	2.75	1.50	2.50	2.40	3.20	2.90	2.90	2.90	2.90	2.30	2.30	2.90	2.90	2.70	2.30	2.30	2.30	3.10	2.90	2.40	3.25	3.25	2.00	2.90
C12	3.15	3.15	2.80	2.20	2.80	2.85	3.10	3.10	2.70	2.90	2.90	2.30	2.85	2.85	2.65	2.80	2.70	2.70	2.30	2.70	2.65	3.00	3.15	2.90	2.20	2.35
C13	2.40	2.95	2.65	2.70	2.55	2.85	2.60	3.25	2.65	2.95	2.90	2.85	2.80	2.95	2.40	2.95	2.95	2.80	2.90	2.35	2.40	3.00	3.10	3.25	2.65	3.30
C14	2.30	2.30	3.10	1.30	3.15	1.90	3.00	2.80	1.40	1.40	1.80	1.50	3.10	3.10	2.70	1.30	1.60	1.60	3.15	3.15	2.70	2.90	1.90	2.80	1.90	2.85
C15	2.70	2.90	2.50	2.20	2.80	2.70	2.90	2.90	2.85	2.85	2.85	2.70	2.85	2.85	2.85	2.85	2.30	2.40	2.60	2.60	2.85	3.50	2.60	2.55	2.30	3.35
C16	3.10	2.75	2.85	2.75	3.20	2.80	2.80	3.20	3.20	2.90	2.85	2.50	2.65	2.80	2.50	2.90	2.75	2.70	3.00	2.60	2.50	2.80	2.90	3.00	2.40	3.00
C17	2.70	2.90	2.50	2.20	2.80	2.70	2.90	2.90	2.85	2.85	2.85	2.70	2.85	2.85	2.85	2.85	2.30	2.60	2.60	2.60	2.85	2.60	2.60	2.55	2.30	3.35
C18	2.70	2.90	2.85	2.60	2.75	2.90	2.90	2.85	2.85	2.85	2.80	2.80	2.80	2.80	2.70	2.80	2.80	2.80	2.90	2.60	2.70	2.30	2.80	2.80	2.30	3.00
C19	3.10	2.90	2.60	2.50	2.95	2.90	2.85	2.85	2.80	2.80	2.90	2.80	2.80	2.70	2.85	2.85	2.80	2.80	2.85	2.40	2.85	2.40	3.30	2.40	1.90	3.05
C20	2.50	3.10	2.80	2.30	3.13	3.38	3.38	3.20	2.85	2.70	2.70	2.70	2.70	2.70	2.75	2.80	2.80	2.75	2.30	2.70	2.75	2.70	2.80	2.80	2.20	3.00
C21	1.20	1.20	2.40	1.30	2.70	1.30	1.30	2.50	2.70	1.00	1.00	1.40	1.30	1.20	1.20	1.00	1.60	1.20	1.20	1.60	1.20	3.00	1.00	1.00	1.00	1.00
C22	1.80	2.50	2.50	2.50	2.30	3.50	4.50	4.50	4.50	4.50	3.50	2.30	2.50	2.40	3.50	1.50	2.50	5.00	1.40	1.30	3.50	3.10	3.50	3.50	1.10	1.10
C23	1.90	1.70	2.20	2.50	2.60	3.50	2.80	2.80	2.90	2.20	2.40	2.80	2.90	3.60	2.00	2.90	2.20	2.60	3.80	3.70	2.00	3.20	2.80	2.40	2.50	2.70
C24	2.50	2.90	2.40	2.10	2.70	2.20	2.10	2.00	1.70	2.20	2.10	1.60	1.80	2.40	2.15	3.00	2.10	3.20	2.00	1.80	2.15	3.30	1.75	2.00	3.40	3.00
C25	2.90	2.90	2.70	2.20	2.35	2.55	2.55	3.20	3.25	2.90	2.90	2.80	2.85	2.85	2.85	2.85	2.70	2.70	3.05	3.00	2.85	2.70	2.70	3.00	2.30	3.20

APPENDIX D
RESPONDENT INFORMATION IN SURVEY PART-I AND PART-II

Appendix D.1: Respondent Information in Survey Part-I

Code	Department	Position	Experience (Years)
PO1	Thimphu Thromde	Chief Engineer	20
PO2	Thimphu Thromde	Executive Engineer	21
PO3	Thimphu Thromde	Executive Engineer	17
PO4	Thimphu Thromde	Executive Engineer	11
PO5	Thimphu Thromde	Engineer	5
PO6	Thimphu Thromde	Engineer	4
PO7	Thimphu Thromde	Junior Engineer	5
PO8	Thimphu Thromde	Junior Engineer	5
PO9	Thimphu Thromde	Assistant Engineer	8
PO10	Thimphu Thromde	Junior Engineer	5
PO11	Thimphu Thromde	Assistant Engineer	29
PO12	Thimphu Thromde	Junior Engineer	5
PO13	Thimphu Thromde	Junior Engineer	5
PO14	ACC office	Project Manager	11
PO15	Ministry of Labor	Executive Engineer	10
PO16	Ministry of Labor	Executive Engineer	11
PO17	Ministry of Education	Engineer	7
PO18	Ministry of Education	Engineer	6
PO19	Ministry of Education	Engineer	8
PO20	Thimphu Dzongkhag	Engineer	13
PO21	DHI	Project Engineer	5
PO22	MoWHS	Engineer	5
PO23	MoWHS	Dy.Executive Engineer	6
PO24	MoWHS	Executive Engineer	18
PO25	Thimphu Dzongkhag	Engineer	7
PO26	Thimphu Dzongkhag	Engineer	8
PO27	ADB project unit	Engineer	9
PO28	ADB project unit	Engineer	11
PO29	ADB project unit	Executive Engineer	19
PO30	Lhuentse Dzongkhag	Assistant Engineer	6
PO31	Lhuentse Dzongkhag	Junior Engineer	5
PO32	Lhuentse Dzongkhag	Assistant Engineer	10
PO33	Lhuentse Dzongkhag	Assistant Engineer	9
PO34	Lhuentse Dzongkhag	Assistant Engineer	11
PO35	ADB project unit	Project Manager	20
PO36	World Bank Project unit	Project Engineer	12
PO37	World Bank Project unit	Project Engineer	12
PO38	World Bank Project unit	Project Engineer	9
PO39	World Bank Project unit	Project Engineer	17

Code	Department	Position	Experience (Years)
PO40	National Housing Development Corp	Engineer	6
PO41	National Housing Development Corp	Dy.Executive Engineer	9
PO42	Department National Property	Engineer	6
PO43	Mongar Dzongkhag	Assistant Engineer	9
PO44	Mongar Dzongkhag	Junior Engineer	6
PO45	Mongar Dzongkhag	Junior Engineer	6
Code	Company Name	Position	Experience (Years)
C1	LHAKI Construction	Project Manager	10
C2	LHAKI Construction	Project Manager	12
C3	NIMA Construction Co. Pvt.Ltd	Executive Engineer	8
C4	YARKAY Construction	Project Manager	8
C5	YARKAY Construction	Project Engineer	13
C6	PENJOR Construction	Project Engineer	7
C7	Construction Development Corp. Ltd	Executive Engineer	12
C8	Construction Development Corp. Ltd	Project Engineer	12
C9	Construction Development Corp. Ltd	Project Engineer	16
C10	LAMNEKHA Construction	Project Engineer	9
C11	TACHO Construction	Project Engineer	7
C12	YARAB Construction	Project Engineer	9
C13	K.N Construction	Project Engineer	8
C14	GYALTSHEN Construction	Project Engineer	6
C15	DANGRAY Construction	Project Engineer	6
C16	BHUTAN Engineering Co.Pvt. Ltd.	Project Engineer	11
C17	GASEB Construction	Project Engineer	8
C18	DRUK CHAPCHAUP Construction	Project Engineer	13
C19	J.D Construction	Project Engineer	11
C20	TSENDEN Construction	Project Engineer	9
C21	SINGYE Construction Pvt. Ltd.	Project Engineer	16
C22	BHUTAN BUILDERS	Project Engineer	15
C23	K. T Construction	Project Engineer	7
C24	CHAPCHA Engineering	Project Engineer	9
C25	RIGSAR Construction	Project Engineer	7
C26	DAMCHU Construction	Project Engineer	7
C27	WELFARE Construction	Project Engineer	5
C28	KASA Construction	Project Engineer	11
C29	NGAWANG Builders	Project Engineer	8
C30	PHUENSUM BUILDERS	Project Engineer	9
C31	KUNLAY Construction	Project Engineer	7
C32	TASHI KUNZOM Construction	Project Engineer	5
C33	WANGTHANG Construction	Project Engineer	9

Appendix D.2: Respondent Information in Survey Part-II

Code	Department	Position	Experience (Years)
PO1	Thimphu Thromde	Chief Engineer	20
PO2	Thimphu Thromde	Executive Engineer	21
PO3	Thimphu Thromde	Engineer	5
PO4	Thimphu Thromde	Engineer	4
PO5	Thimphu Thromde	Assistant Engineer	29
PO6	ACC office	Project Manager	11
PO7	Ministry of Labor	Executive Engineer	10
PO8	Ministry of Labor	Executive Engineer	11
PO9	Ministry of Education	Engineer	6
PO10	Thimphu Dzongkhag	Engineer	13
PO11	DHI	Project Engineer	5
PO12	MoWHS	Engineer	5
PO13	MoWHS	Dy.Executive Engineer	6
PO14	MoWHS	Executive Engineer	18
PO15	Thimphu Dzongkhag	Engineer	7
PO16	Thimphu Dzongkhag	Engineer	8
PO17	ADB project unit	Engineer	9
PO18	ADB project unit	Engineer	11
PO19	ADB project unit	Executive Engineer	19
PO20	ADB project unit	Project Manager	20
PO21	World Bank Project unit	Project Engineer	12
PO22	World Bank Project unit	Project Engineer	12
PO23	World Bank Project unit	Project Engineer	9
PO24	World Bank Project unit	Project Engineer	17
Code	Company Name	Position	Experience (Years)
C1	LHAKI Construction	Project Manager	10
C2	LHAKI Construction	Project Manager	12
C3	NIMA Construction Co. Pvt.Ltd	Executive Engineer	8
C4	YARKAY Construction	Project Manager	8
C5	YARKAY Construction	Project Engineer	13
C6	PENJOR Construction	Project Engineer	7
C7	Construction Development Corp. Ltd	Executive Engineer	12
C8	Construction Development Corp. Ltd	Project Engineer	12
C9	Construction Development Corp. Ltd	Project Engineer	16
C10	LAMNEKHA Construction	Project Engineer	9
C11	TACHO Construction	Project Engineer	7
C12	YARAB Construction	Project Engineer	9

Code	Company Name	Position	Experience (Years)
C13	K.N Construction	Project Engineer	8
C14	DANGRAY Construction	Project Engineer	6
C15	J.D Construction	Project Engineer	11
C16	SINGYE Construction Pvt. Ltd.	Project Engineer	16
C17	BHUTAN BUILDERS	Project Engineer	15
C18	K. T Construction	Project Engineer	7
C19	CHAPCHA Engineering	Project Engineer	9
C20	RIGSAR Construction	Project Engineer	7
C21	DAMCHU Construction	Project Engineer	7
C22	WELFARE Construction	Project Engineer	5
C23	KASA Construction	Project Engineer	11
C24	TASHI KUNZOM Construction	Project Engineer	5
C25	WANGTHANG Construction	Project Engineer	9

Appendix D.3: Interviewee Information

Code	Department /Company	Position	Experience (Years)
PO1	Thimphu Thromde	Chief Engineer	20
PO2	Thimphu Thromde	Executive Engineer	21
PO3	Thimphu Thromde	Engineer	5
PO4	Thimphu Thromde	Engineer	4
PO5	Thimphu Thromde	Assistant Engineer	29
PO6	Anti-Corruption office	Project Manager	11
PO7	Ministry of Labor	Executive Engineer	10
PO8	Thimphu Dzongkhag	Engineer	13
PO9	DHI- Infrastructure unit	Project Engineer	5
PO10	MoWHS	Dy.Executive Engineer	6
PO11	ADB project unit	Executive Engineer	19
PO12	World Bank Project unit	Project Engineer	17

BIOGRAPHY

Mr.Sonam Tashi was born on 17th March, 1982 in Thimphu, Bhutan. He started his schooling at Minjiwoong Primary School and studied at various schools in Bhutan. He completed his last high school from Zhemgang Higher Secondary School in 2002.

In 2007, he completed his Bachelor of Engineering (B.E Civil) from Hindustan College of Engineering, Anna University-Chennai, India. His undergraduate project was on Structural Engineering in “Earthquake Resistant Design for Building Frame”. He secured first ranked during his 4 years bachelor degree program.

He worked 3 years as Engineer (Civil) in Thimphu Thromde (Municipal Office) under Ministry of Works and Human Settlement before he received TICA Scholarship for Master Degree in 2011. He preferred Construction Engineering Management as he was interested and experienced in construction field besides his interest in structural engineering. In 2013, he completed his Master of Civil Engineering in Construction Engineering Management from Chulalongkorn University, Thailand.

He is interested in improving construction process in Bhutanese construction industry. His research interests are in construction management especially in solving construction problems and conflicts in project management issues, project control, Building Information Modeling (BIM), green building, contract, structural engineering and challenges in sustainable and disaster management.