Effect of stakeholder's conflicts on project constraints in construction industry

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has been accepted towards the partial fulfillment of the requirements for the degree of Master of Science in Construction Engineering and Management

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In the name of Almighty Allah, the most Merciful, the Beneficent. All praise is only for Allah who created us and always planned the best for us. I am grateful to the Almighty Allah for His countless blessings and mercy bestowed upon me through the difficulties of life and I seek His guidance and pray to Him for blessings and ease throughout this life and the life to come.

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Abstract

The purpose of this research is to highlight the most significant project constraints and factors that cause stakeholder's conflicts. Additionally, the effect of stakeholder's conflicts on project constraints in construction industry is investigated. For this purpose, a statistical model was developed and a questionnaire survey was carried out from 170 industry professionals. Ordinal regression analysis technique was used for model development. The results show that all project constraints are affected by stakeholder's conflicts in construction industry. Factors that cause stakeholder conflicts indicate a positive relationship with cost, time and resources used in projects. This means that any increase or decrease in the effect of stakeholder's conflicts will directly influence these three project constraints. Similarly, a negative relationship was observed between stakeholder's conflicts and quality, workforce productivity, protection of environment and safety regulations in construction industry, indicating that increase in the effect of stakeholder's conflicts will decrease these four project constraints and vice versa. The results for cumulative ordinal regression model highlight that lack of communication, poor quality of completed works and change orders and rework have intense effects on project constraints collectively. The contribution of this research in the body of knowledge is in the light that a small number of studies have examined the emergence of project constraints in developing countries, and even more, its relationship with stakeholder's conflicts in construction industry is limited. This research highlights the most significant project constraints and factors that result stakeholder's conflicts in construction industry. Therefore, this study adds to the existing body of knowledge by developing ordinal regression models that will help decision makers and top management to control this enigma of stakeholder conflicts in construction industry.

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Chapter 1

Introduction

1.1 Study background

The construction sector is indispensable for any economy because of its significance and the prospect of economic development it can provide. According to Schilling (2013), the contribution of global construction industry towards GDP is 13% and this number will escalate to 15% in 2020. The nature of projects involved in construction industry are highly uncertain, dynamic and complex (Aaltonen, 2011; Jaffar et al., 2011) which engages wide array of stakeholders with differing concerns and requirements that need to be addressed in order to successfully achieve project objectives (Olander, 2007). Project stakeholder as defined byPMI (2017) is an *"individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project"*. Construction is a team oriented endeavor where success is largely dependent on stakeholder's commitments (Leung et al., 2004) and project goals can only be achieved if they are fully invested(Liu, 1999). Stakeholders may be actively involved in the project or have interests that may be positively or negatively affected by the performance or completion of the project(PMI, 2017).

Due to a great diversity of stakeholder's involvement in construction projects and extensive heterogeneity of situations emanating from construction processes, stakeholder's conflicts are inevitable and require particular consideration (Gorse, 2003; Moura and Teixeira, 2009; PMI, 2017). Moura and Teixeira (2009)defined conflict as *"a process that begins whenever an individual or a group feels negatively affected by another individual or group"*. Awakul and Ogunlana (2002) classified stakeholder's conflicts into internal and interface conflicts that occur within large construction projects. According to them, internal conflicts originate from the participants inside the project domain, such as architects, contractors, engineers, etc. Whereas interface conflicts involve parties outside the projects such as residents, landowners, regulatory agencies, etc.

In a study conducted by Sambasivan and Soon (2007), delay in the payments for completed work, frequent owner interference, changing requirements, lack of communication between concerned parties, problems with neighbors and unforeseen site conditions are the factors that result in conflicts between the various parties involved. Subsequently, Acharya et al.

(2006)highlighted six factors that cause construction conflicts in Korea namely differing site conditions, local people obstruction, differences in change order evaluation, errors and omissions in design, excessive quantity of work and double meaning in specifications. Further, Davis (2016) concluded that project success essentially depends on project stakeholders and project structure that comprises time, cost, quality. Therefore, projects must pay close attention towards the stakeholders whose influence can bring variations in the course of project or even disrupt it (Wit, 1988). According to Khahro and Ali (2014), consequences of the conflicts include cost and time overrun, loss of productivity and profit, and damage in business relationship. These conflicts if ignored may obstruct the project completion and sabotage stakeholder's relationship which in turn affect the project constraints (Narh et al., 2015), compromising time, cost, quality and scope of the projects during design and implementation phases (Olander and Landin, 2005).

The literature emphasizes to avoid stakeholder's conflicts because they gravely impact the smooth flow of projects. Khahro and Ali (2014) are of the view that it is essential for projects to finish within stipulated time, cost and specified quality but among many other factors that bring obstruction in construction projects, the art of dealing with conflicts play a significant role. Due to conflicting stakeholder's interests, many technically viable and economically sound and well-planned projects fail (Gyan and Ampomah, 2016). As a result, stakeholders engage in dispute due to which many projects either do not achieve the set targets or are abandoned in midstream (Field, 1966). The published literature focused on the conflict emergence in construction industry is small in number and even more its linkage with construction project constraints is limited.

Therefore, the purpose of this study is to highlight the most significant factors that cause stakeholder's conflicts along with the identification of prominent project constraints. Using ordinal regression analysis, the effect of stakeholder's conflicts on project constraints in construction industry is accentuated. This study adds to the existing body of knowledge by proposing ordinal regression models that will help decision makers and top management to control this enigma of stakeholder conflicts in construction projects.

1.2 Problem statement

With each passing day, construction projects are becoming more complex with the involvement of multiple stakeholder groups, therefore for successful project delivery interests of all the

stakeholders must be highlighted and included in an organized way (Olander, 2007; Aaltonen, 2011). For this purpose stakeholder identification is significant, failing to identify and engage stakeholders will lead to conflicting situations (Amoatey and Hayibor, 2017). In fact, Jaffar et al. (2011) stated that construction projects are complicated and conflict between various stakeholders can occur easily. As the conflicts are inevitable in construction industry, therefore conflict management and conflict resolution should be implemented during project operations. Conflict management as defined by PMI (2017) is *"handling, controlling, and guiding a conflictual situation to achieve a resolution*". One of the factor of construction project failure is stakeholder conflicts and its effects on project constraints are obvious resulting time overruns, cost escalations, decrease in productivity, decreased profits etc.(Jaffar et al., 2011).

To deal with this enigma of conflicts and their effects on projects and project constraints, it is especially important to identify the factors causing construction conflicts between different stakeholder groups. If we find out these causes early, then the problems can be cured immediately. Much work has been done in literature regarding stakeholder identification, stakeholder management, stakeholder conflict management and dispute resolutions but there is dearth of research in which the effects of stakeholder conflicts have been highlighted on project constraints as project is considered a success if it is accomplished by remaining within the boundaries of project constraints.

Therefore, a comprehensive and robust framework covering all the aspects and effects of stakeholder conflicts on project constraints is needed. The purpose of this research is to identify the most significant causes of stakeholder conflicts in construction industry along with the identification of prominent project constraints. After that a framework will be developed which will highlight effects of stakeholder conflicts on project constraints and recommendations on reducing stakeholder conflicts.

1.3 Research objectives

Following are the primary objectives of this research:

1. To identify the most significant factors that result in stakeholder conflicts along with project constraints in construction industry

2. To develop statistical models from highlighted factors of stakeholder conflicts with respect to project constraints

3. To recommend the solutions for minimizing stakeholder conflicts

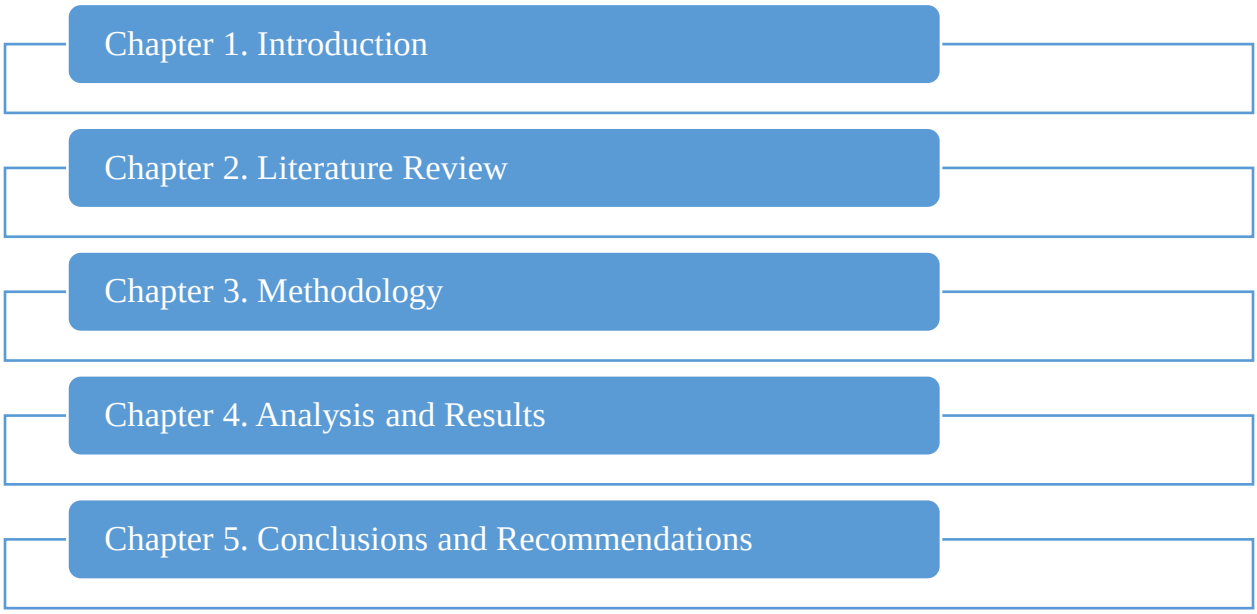
1.4 Research significance

This research will provide a framework as a source of guidance for top management and decision makers to avoid stakeholder's conflicts. Additionally, stakeholder's conflicts can be avoided with their timely coordination, cooperation and participation which otherwise pose considerable risks on project constraints thus causing delays, cost overruns and quality compromises. Following different research significance will be achieved from this study:

1. Identification of important factors that are pertinent to stakeholder's conflicts in construction industry
2. Identification of dominating project constraints in construction industry
3. Improve the efficiency of projects by meticulously solving the stakeholder's conflicts encountered during the project's life
4. Country's economic growth will be enhanced
5. Optimum utilization of resources can be ensured if this enigma of stakeholder's conflicts is resolved carefully

1.5 Thesis structure

This thesis comprises five chapters. The order and brief description of these chapters is given below:



Chapter 1. Introduction

This chapter includes study background, problem statement, research objectives, research significance and thesis structure.

Chapter 2. Literature Review

This chapter covers stakeholder definitions, stakeholder conflict definitions, stakeholder attributes and classification, classification of conflicts in construction industry, conflict management, dispute resolution techniques and project constraints.

Chapter 3. Methodology

This chapter covers introduction, research strategy, tools and techniques and preliminary survey.

Chapter 4. Results and discussions

This chapter covers the results in detail

Chapter 5. Conclusions and recommendations

Chapter 2

Literature Review

2.1 Introduction

The intricacy of construction industry, diverse group of independent stakeholders, distinctive site conditions and involvement of various project management teams can usually cause antagonistic environment, which might end up creating conflicts between the concerned parties (Harmon, 2003; Kassab et al., 2006; Ning and Ling, 2013) and the diversity of stakeholders in construction projects can unexpectedly complicate the state of affairs (Panahi et al., 2017).Stakeholders play a significant role in any project and they ascertain the project progress in all its phases. With the passage of time, the construction projects are becoming bigger, more challenging and complicated. Project stakeholders require quicker delivery and escalated quality standards(Yang et al., 2009). Project constraints drive projects and they must as well meet requisite regulations, construction codes and various standards. For projects to be successful, stakeholder management is essential to avoid the conflicts(Wang and Huang, 2006).Therefore, project stakeholder management has a significant role in project management (Olander and Landin, 2005).

2.2 Definition of stakeholder

The concept of stakeholder can be traced back to 1963 when this word was first used by researchers in a memorandum at Stanford Research Institute. According to that concept, stakeholders are *"those groups without whose support the organization would cease to exist"*(Olander, 2007).Freeman (1984) gave a more refined, broader and robust definition for stakeholders in his book "Strategic Management: A Stakeholder perspective". According to him stakeholders are "*any group or individual who can affect or is affected by the achievement of the firm's objectives".* Stakeholders may be actively involved in the project or have interests that may be positively or negatively affected by the performance or completion of the project (PMI, 2013).

According to Mitchell et al. (1997),they are the individuals/groups who are affected by the financial decisions and interests of involved organizations. Project stakeholder as defined by PMI (2017) is an "*individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project*". Similarly, Newcombe

(2003) defined stakeholders as groups or individuals who have interest or an expectation with the project outcome that may include internal or external stakeholders.

2.3 What is stakeholder's conflict?

One of the major challenges faced by today's construction industry includes conflicts, claims and disputes (Labarre et al., 2013). The projects are becoming more complex and challenging as a result of which the project success has different meaning for different stakeholders(Toor and Ogunlana, 2010). The loss of one is termed as gain of the other and vice versathus balance should be established. A project that is considered a success by end users or contractor may be perceived as total failure by client (Toor and Ogunlana, 2008). Therefore, diverse stakeholders in any project may have disparate concerns, conflicting demands and interests (Aaltonen, 2011). As a result of this, their anticipation pertinent to project success may also vary (Bryde and Brown, 2004).If the stakeholders are not managed effectively, their concerns and objectives are not identified then project can face acute conflicts and problems (Rahim, 2002). In fact,Yiu and Cheung(2006) believe that due to varying interests of the stakeholders, conflicts are ineluctable.

According to Wu et al. (2017) , conflict is a complex social and psychological phenomenon, different opinions about conflict processes, causes and outcomes exist. Correspondingly, different disciplines such as economics, sociology, philosophy and management have used varying approaches to describe conflict. Moura and Teixeira (2009)defined conflict as "*a process that begins whenever an individual or a group feels negatively affected by another individual or group*". According to them conflict can also be defined as "*an interaction of independent people who acknowledge different objectives, wishes and values in the other part, capable of interfering with their own".* Similarly, Korsgaard et al. (2008) presented their definition of conflict as perception amid parties that their goals and interests are not compatible but conflicting with each other. A more generic definition for conflict presented by many researchers is the discernment of a party's concerns and objectives which are obstructed by another party, whether genuine and authentic or perceived, the intensity and level of which is directly linked with the degree of party's dedication towards its goals (Deutsch, 1969; Cosier et al., 1991; Wall and Callister, 1995).

2.4 Stakeholder attributes and classification

The survival of organizations is heavily dependent on the support of stakeholders (Freeman, 1984). The interests and concerns of stakeholders are directly linked with the activities of organizations and they have the capacity to affect or be affected by organization's goals (Freeman, 1984; Donaldson and Preston, 1995). There are several approaches in stakeholder theory literature that elaborates stakeholder identification and salience (Freeman, 1984; Savage et al., 1991; Grimble and Chan, 1995). In fact, according to Mitchel et al. (1997), stakeholder salience is significantly dictated by managerial perspectives which means giving importance to particular stakeholder over the other. Stakeholder salience as defined by Mitchell et al.(1997) is *"the degree to which managers give priority to competing stakeholder claims*".

Stakeholder salience is divided into three attributes: power, legitimacy and urgency. Mitchell et al.(1997)defined power, as the possibility that one stakeholder despite defiance would be in position to impose his/her will when in social relationship. Legitimacy is defined as *"a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions"*(Mitchell et al., 1997). Project managers are more inclined towards stakeholders who they think have legitimate claims (Aaltonen and Kujala, 2010). Urgency is defined as the gravity and necessity of stakeholder claims and giving significance accordingly(Mitchell et al., 1997)and it depends on two attributes: time sensitivity and criticality, in other words, urgency is directly linked with the interest of stakeholder (Aapaoja and Haapasalo, 2014). The importance of urgency attribute as compared to power and legitimacy is not that much compelling but its significance cannot be ignored.

There is a diversity in classification of stakeholders and depends on various guidelines (Fassin, 2009) but the stakeholder classification is somewhat similar in nature (Smith and Love, 2004; Winch, 2010). Mitchell et al. (1997)categorized stakeholders into eight different classes depending on the attributes of stakeholders: power, legitimacy and urgency. Table 1 explains this classification in detail.

Table 1: Classification of Stakeholders (Mitchell et al., 1997)

Stakeholder Type	Definition	Attribute	Example
Dominant	Dominant stakeholders possess both power and legitimacy to influence the outcomes of firm decisions. In fact, their expectations will be given due weightage.	Power Legitimacy	The municipality, local councils, state government, politicians
Definitive	Definitive stakeholders have all the attributes and with dominant coalition within organization their claims will be given top priority by the mangers.	Power Legitimacy Urgency	Federal and state governments, steering committee
Demanding	Demanding stakeholders have relationship with managers based on urgency attribute only, therefore, management can disregard their claims as they are not fatal for organization.	Urgency	Emergency organizations, humanitarian aid agencies
Dangerous	Dangerous stakeholders lack the attribute of legitimacy but possess power and urgency attributes. Due to their coercive attitude they can be dangerous to organizations.	Power Urgency	The media
Dormant	Dormant stakeholders only have power attribute to impose their will but due to unavailability of legitimate relationship or urgent claims their power remains unused.	Power	Private financiers, risk capital companies, investors
Discretionary	Discretionary stakeholders have attribute of legitimacy but lack power or urgent claims because of which their influence is not fatal to organization's decisions.	Legitimacy	City planners, local councils' staff, architects and engineers

Dependent	Dependent stakeholders have urgent claims and legitimacy attribute but lack power. For that they rely on others for power to make their decisions effective.	Legitimacy Urgency	Local community, local councils
Non-stakeholder	Non-stakeholders are the ones having no attribute with them, so they cannot be considered as 'stakeholder'.	No attribute	

From Figure1, Mitchell et al. (1997) further grouped these stakeholders into latent, expectant and definitive stakeholders. Latent stakeholders have only one of three above mentioned attributes and contain dormant, discretionary and demanding stakeholders. Similarly, expectant stakeholders hold two attributes and dominant, dependent and dangerous stakeholders are included in it. Whereas, definitive stakeholders possess all three attributes.

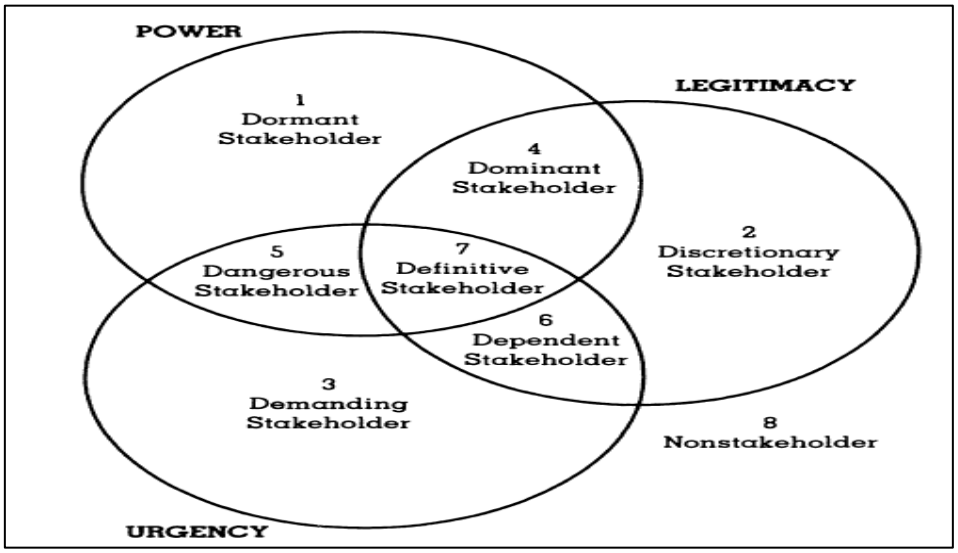


Figure 1: Classification of stakeholders (Mitchell et al., 1997)

Aapaoja and Haapasalo (2014)classified and prioritized stakeholders into primary team members (project core team), key supporting participants, tertiary stakeholders and extended stakeholders. Where primary team members (PTM) and key supporting participants are regarded as internal stakeholders, tertiary and extended stakeholders are termed as external stakeholders. According to them the concerns of primary team members, key supporting participants and tertiary

stakeholders must be given due attention to make the project successful. PTM includes client, main contractor and architect but may include others as well. Key supporting participants include consultants, sub-contractors and designers. Tertiary stakeholders help in project implementation by delivering resources financially and logistically along with providing regulations. Whereas, extended stakeholders comprise media, NGO's and residents who may have some concerns related to the project.

Similarly, Cusumano et al. (2008)classified stakeholders into five groups: corporate government stakeholders, internal economic stakeholders, external economic stakeholders, regulatory stakeholders and social external stakeholders. Subsequently, Clelandand Ireland (1999) classified stakeholders into internal and external stakeholders, these stakeholders presented in Figure 2 can be divided into nine groups.

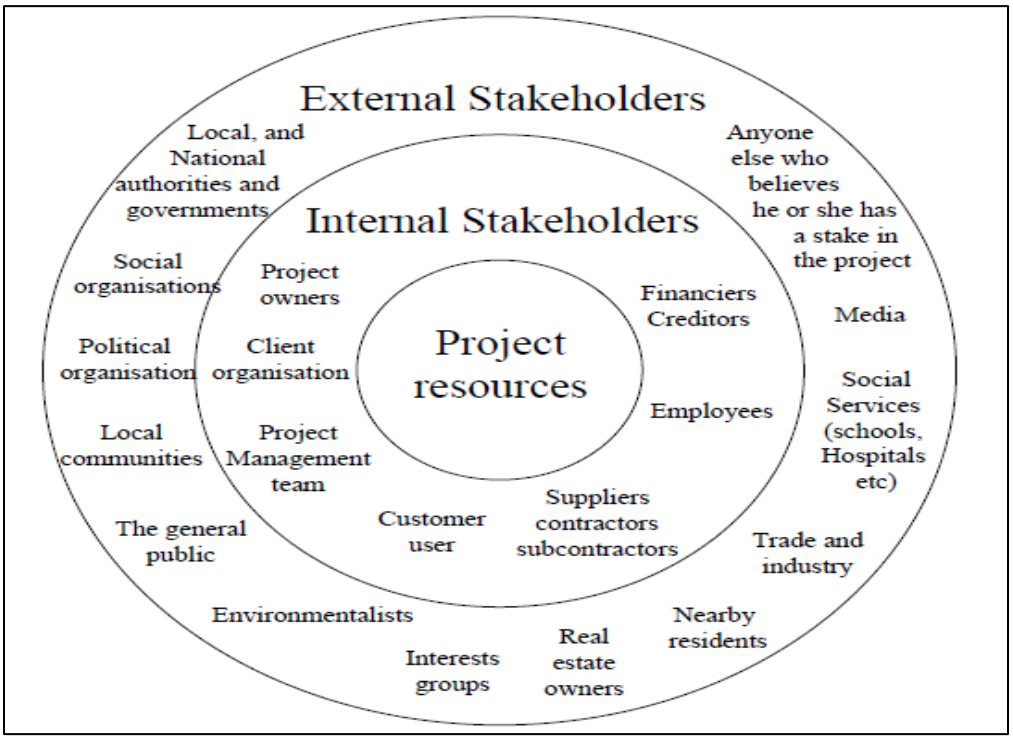


Figure 2:Classification of stakeholders (Cleland and Ireland, 1999)

Table 2 explains this classification in detail.

Table 2: Classification of Stakeholders (Cleland and Ireland, 1999)

Classification of Stakeholders	
Internal Stakeholders	
Project owner	Most relevant stakeholder and project sponsor, project developer and project initiator.
Project management team	Ensures that project is completed as per defined specifications and prerequisites by the project owner.
Suppliers	Services and products are delivered by suppliers to any organization.
Customers	End user of any product/project whether any individual or organization.
External Stakeholders	
Public	Important stakeholder who have no control over the project resources but can get advantages from project and suffer its negative consequences as well.
Local and national authorities	It comprises civil servants and politicians. Their influence on project decision is significant, so they must be considered in project decision phases.
Trade and industry	These stakeholders have similar interests to that of public. They can get benefit and suffer the consequences of project.
Interests group	Also called as lobby groups, since they can act as either supporters or opponents of the project depending on their interests.
Media	They cannot be considered as serious stakeholders since they don't have any stakes in projects, but they can influence other stakeholders which in turn can affect the decisions pertaining to project.

2.4.1 Stakeholder's mapping

Identification of stakeholder desires and requirements is not enough to successfully administer the stakeholder concerns and interests therefore project management team should also be aware of stakeholder's power and their influence on project outcomes (Olander, 2003).The directions and decisions pertaining to the project are influenced by stakeholder's power. Stakeholder's motives and attitudes play a significant role in enforcing any change or attaining commendation for controversial decisions during the life of a project (Newcombe, 2003). On individual basis, a powerful stakeholder can affect the project outcomes but it is mostly the group of stakeholders who join to form temporary alliance to influence the project strategy (Newcombe, 2003). Stakeholder mapping tool given by Johnson et al. (2008) is used to identify stakeholder's interests and power that helps in understanding their preferences. It answers two important questions:

1. How interested is each stakeholder in project decision making and in what way they can influence the project outcomes?
2. Do stakeholders possess enough power to impose their will?

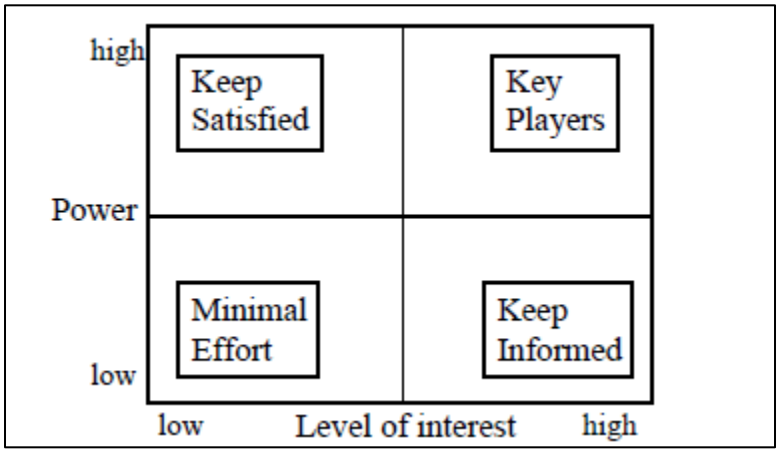


Figure 3: Stakeholder mapping, power/interest matrix (Olander, 2003; Johnson et al.,2008; Aapaoja and Haapasalo, 2014)

From Figure 3, key players are most significant stakeholders, their interest and power is very high and they can gravely influence the project outcomes (Olander, 2003). Keep informed stakeholders have little influence/impact on decision making and project outcomes but their interest is high i.e. local residents, non-government organizations (Aapaoja and Haapasalo,

2014). Keep satisfied stakeholders include national governments, authorities or other alike organizations, they have little interest in project but their impact on project outcomes is very high (Aapaoja and Haapasalo, 2014). Similarly, stakeholders that are in minimal effort square have neither interest in project nor any significant impact on project outcomes, but this does not mean such stakeholders can be ignored (Olander, 2003).

2.4.2 Stakeholder's satisfaction in construction projects

Li et al. (2013) defined stakeholder satisfaction as successfully meeting the project goals and objectives highlighted by stakeholders before the project initiation and that can also be seen during the project execution phases in real. In fact, if the project teams are not able to see things from client's point of view, they will be dissatisfied (Mbachu and Nkado, 2006). According to Li et al. (2013),due to diverse interests and different roles played by stakeholders during the projects, determining their overall satisfaction is complicated, as a result of such mismatch, achieving stakeholder satisfaction is challenging. There should be a balanced approach where communication between stakeholder groups should be ensured in an efficient way by maximizing their participations. Strong et al. (2001) suggest from their study that to ensure stakeholder satisfaction, all the managers should be honest and truthful in their conduct with concerned stakeholders, keep them informed without fabricating anything from themselves.

2.5 Classification of conflicts in construction industry

According to Moura and Teixeira (2009) conflicts differ in terms of their framework, whether political, constitutional, economic, cultural, social or based on various stakeholder interests, technical expertise, surrounding environment and previous history. It is this variation in concerns and interests of stakeholders that act as a catalyst for conflicts (Whitfield, 1994). Project outcomes can be modified and affected in multiple ways due to various types of conflicts (Mele, 2011) and these conflicts can positively or negatively influence the project (Wu et al., 2017). Conflicts can be categorized into different types. Table 3 describes various types of conflicts along with their definitions.

Table 3: Classification of conflict

Type and definition of conflict	Author reference
Cognitive conflict: It includes task-oriented differences that result from varying perspectives and dissatisfaction of team members related to undertaken tasks without the involvement of adversarial attitude or behavior.	(Amason and Sapienza, 1997; Prasad and Junni, 2017)
Emotional or affective conflict: Involves individual-oriented differences arising from personal discontent, hate or misconception. Because of this conflict, team members can become stressed, irritating and even aggressive.	(Pelled and Adler, 1994; Amason and Sapienza, 1997)
Collaborative or cooperative conflict: The team members share friendly and trusting behaviors towards each other within conflict scenario. They presume the conflict as mutual problem and try to solve it with each other's cooperation.	(Rudawsky et al., 1999; Wong et al., 1999; Hempel et al., 2009)
Competitive conflict: In this conflict the team members have dubious and aggressive attitudes towards each other and always try to exploit other's necessities. All the involved people see such conflict as either winning or losing situation.	(Rudawsky et al., 1999; Wong et al., 1999; Hempel et al., 2009)
Relationship conflict: This conflict arises because of differences due to interpersonal inconsistencies that involves stress, bitterness and hostility resulting disintegrated communication between stakeholders.	(Martínez-Moreno et al., 2009; Senaratne and Udawatta, 2013; Lee et al., 2015; Hu et al., 2017; Vaux and Kirk, 2018)
Task conflict: Task conflicts are linked with differences between the team members with achieving certain tasks that include decisions, perceptions, opinions, objectives, ideas and conceptions related to that task.	(Pelled and Adler, 1994; Martínez-Moreno et al., 2009; Senaratne and Udawatta, 2013; Lee et al., 2015; Hu et al., 2017; Vaux and Kirk, 2018)
Process conflict: "an awareness of controversies about aspects	(Martínez-Moreno et al.,

of how task accomplishment will proceed"	2009; Senaratne and Udawatta, 2013; Lee et al., 2015)
Open conflict: Open conflicts are those in which every participant is aware of the ongoing situation. *Hidden conflict:* Hidden conflicts are known to few stakeholders. *Latent conflict:* Latent conflict only appear in front of people when there comes certain change in the present situation.	(Moura and Teixeira, 2009)
Well-defined conflict: Has clearly elucidated constraints and accurately established boundaries, as a result remedies for such conflict exist. *Ill-defined/fuzzy conflict:* Fuzzy or ill-defined conflicts involves uncertain goals and objectives, essential variables are not measurable, interests of the stakeholders may not be defined noticeably, consequently, it becomes strenuous to resolve issues.	(Rijsberman, 1999)

2.5.1 Conflict level

The causation of conflict is a multilevel event (McAdam, 2005) and considering this view, conflict can occur between both individuals or groups of stakeholders. Korsgaard et al. (2008) are of the view that the involvement of more than two parties mean the conflict can occur between individuals, amid individuals, and between or within groups. They presented their model for group of conflicts at three levels: individual level (between individual members and stakeholders), dyadic level (relationship between various parties) and intragroup level. Similarly, Moura and Teixeira (2009) classified conflicts on the occurrence of level of conflicts: intra-personal conflicts (between individuals), intra-grouping (between two or more members of the same group), intra-organization (within same organization), inter-group (among various groups) and inter-organization (between different organizations).

2.5.2 Conflict objective

Another way to understand the gravity of the conflicts and searching for remedy to resolve the conflicts is to see the conflicts occurring as a result of opposing motives/objectives of the

stakeholders (Dorpat, 1976). Considering this perspective, Moura and Teixeira (2009) distinguished conflicts on the basis of object/motive or the fundamental issue behind the conflict. According to them, conflicts can arise because of differing or incompatible objectives, obligations and concerns between the interested parties. Similarly, when differing procedures and strategies are adopted in resolving the same problem or issue then conflicts will arise over the processes between groups, individuals and organizations. Consequently, if the stakeholders are not provided with their relevant positions and power within the social setup in terms of cultural, legal, social or economic categorizations, then conflicts will emerge.

2.5.3 Conflict life cycle

Conflicts in a construction project can transform from one stage to the next with greater intensity and possess a life cycle phenomena with it (Moura and Teixeira, 2009). Pertinent to conflict life cycle, Pondy (1967) developed a model which explains in detail as how the conflict starts and the stages it goes through. He called this model as "conflict episode". The five identified stages as can be seen in Figure 4 include: latent conflict, perceived conflict, felt conflict, manifest conflict and conflict aftermath.

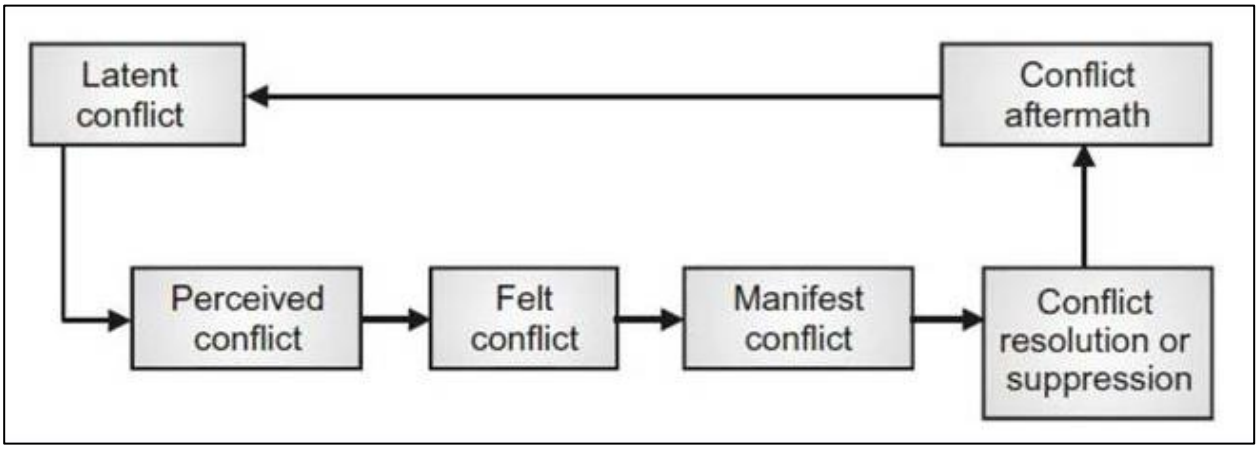


Figure 4: Conflict episode concept (Pondy, 1967)

According to Pondy (1967), in latent conflict stage the factors related to specific situation may be present that will act as a catalyst for conflict latter, the categories of which involves: competition for insufficient resources, urge for independence, varying goals and role conflict. When the communication between groups is weak, relevant positions of other participants are misunderstood, incompatibility of goals between parties is involved then perceived conflict arises even without the presence of latent conflict. Once the perceived conflict stage is faced then

comes felt conflict stage that involves the realization and acceptance of conflict. In manifest conflict stage, conflicting attitudes and behaviors come to surface. The clearest of these include open aggression, indifference, vandalism and disobedience to rules. To tackle this stage, it is especially important to search for the behaviors of involved parties. The consequences of the conflict may be positive or negative for the stakeholders, but it solely relies on the way conflict was resolved. If the resolved conflict is based on mutual consent and satisfaction of involved parties, then solid foundations for cooperative relationship can be established whereas if the conflict is repressed not resolved, then this conflict will get graver and intensified until they are not amended with mutual satisfactions.

As the construction includes repetitive processes involving various stakeholders having differing interests and demands, it is inevitable that all types of conflicts may arise, therefore these conflicts should be managed and resolved in due time to avoid antagonistic events (Moura and Teixeira, 2009), for that the identification of potential causes along with the origin of conflicts are very significant in this matter.

2.5.4 Potential causes of stakeholder conflicts

Stakeholder conflicts can occur at all the phases of construction projects (Wu et al., 2017). Causes of conflict existence are numerous such as misunderstanding of project plans, limited project resources and priorities of each stakeholder (Blokhuis et al., 2012). Sinha and Wayal (2007) conducted their study in which series of models were developed to illustrate the interdependency among various variables that result in conflicts. They highlighted that scope change, errors in contract documents and varying goals and objectives are major factors contributing in stakeholder's disputes. In another study, Cakmak and Cakmak (2014) analyzed the main causes of stakeholder's conflicts pertinent to construction industry. They classified the factors into following categories: owner, contractor, design, contract, human behavior, project and external factors. Consequently, Mitkus and Mitkus (2014) are of the view that majority of contemporary authors highlight only the visible signs of conflicts as their causes. But they analyzed the causes of conflicts emerging between clients and contractors in construction industry in a different light. They concluded that lack of communication between them is the driving factor that generates conflicts.

Similarly, Jaffar et al. (2011) grouped the factors that cause conflicts into behavioral, contractual and technical problems. Behavioral problems include poor communication among project teams, multicultural nature of teams and reluctance to check for clarity and completeness of project brief. The factors of contractual problem which include delay in interim payment, failure to respond in timely manner, application of extension of time and improper project schedules. Finally, contractor's quality of work, error of pricing or costing, late instructions from architect or engineer are considered as the factors of conflict due to technical problems. Moreno et al. (2009) suggested that lack of communication or weak communication produces conflicts resulting into lower project performance.

Adnan et al. (2012) commended that relationship, mutual trust, risk sharing, cultural barriers, dedication and weak communication are significant conflict causing factors. Suprapto et al. (2016) highlighted contract and project size as major factors contributing to project conflicts. Sibaie et al. (2014) revealed six factors pertinent to stakeholder conflicts: external, internal, control related, knowledge related, management related and social related. In a similar study, Harmon (2003) highlighted that conflicts may develop as a result of scarcity of resources such as limited time, money, labor, material and equipment. Consequently, Meng (2012) concluded that poor contractor management, poor construction design, poor labor performance, poor technical ability, material procurement problems, lack of necessary equipment, adverse weather conditions, unforeseen site conditions, market fluctuations and regularity changes result in stakeholder conflicts in the construction industry.

Subsequently, significant factors that cause stakeholder conflicts and prominent project constraints relevant to construction industry are extracted after detailed literature review from 2006-2018 period. 13 factors that cause stakeholder conflicts and 7 project constraints were finalized after performing content analysis. These factors are presented in Table 4 and Table 5 shown below and are used for further analysis:

Table 4: Significant factors causing stakeholder conflicts

Author reference	Factors causing conflicts	Frequency	Total score (normalized literature and industry scores)	Cumulative normalized total score	Ranking
(Lo et al.,2006; Yang et al., 2009; Israngkura, 2011; Adnan et al., 2012; Ilter, 2012; Yong and Mustaffa, 2013; Cakmak and Cakmak, 2014; Elmaghri, 2014; Mitkus and Mitkus, 2014; Farooqui and Azhar, 2014; Yildizel et al., 2016; Mahamid, 2016; Musah and Isha, 2017; Wu et al., 2017; Gamil and Rahman, 2018)	Lack of communication between construction parties	15	0.049	0.049	1
(Acharya et al., 2006; Israngkura, 2011; Ilter, 2012; Yong and Mustaffa, 2013; Peansupap, 2013; Tashi and Peansupap, 2013; Cakmak and Cakmak, 2014; Wang et al., 2015; Yildizel et al., 2016; Mahamid, 2016; Ejohwom, 2016; Charehzehi et al., 2017; Assaf et al., 2018)	Poor quality of completed works	13	0.045	0.093	2

(Acharya et al., 2006; Sinha and Wayal, 2007; Petter and Nils, 2010; Israngkura, 2011; Ilter, 2012; Yong and Mustaffa, 2013; Peansupap, 2013; Cakmak and Cakmak, 2014; Yildizel et al., 2016; Ejohwom, 2016; Charehzehi et al., 2017; Dosumet al., 2017; Wu et al., 2017)	Contractual problems and errors in contractual documents	13	0.045	0.138	3
(Acharya et al., 2006; Lo et al., 2006; Sinha and Wayal, 2007; Petter and Nils, 2010; Israngkura, 2011; Ilter, 2012; Meng, 2012; Peansupap, 2013; Tashi and Peansupap, 2013; Cakmak and Cakmak, 2014; Yildizel et al., 2016; Mahamid, 2016; Ejohwom, 2016; Charehzehi et al., 2017; Chidiebere and Idiake, 2018)	Change orders and rework	15	0.045	0.183	4
(Acharya et al., 2006; Israngkura, 2011; Ilter, 2012; Yong and Mustaffa, 2013; Peansupap V., 2013; Elmaghri, 2014; Farooqui and Azhar, 2014; Wang et al., 2015; Yildizel et al., 2016; Mahamid, 2016; Ejohwomu, 2016; Charehzehi et al., 2017)	Delay in progress payments by owner	12	0.043	0.226	5

(Acharya et al.,2006; Lo et al.,2006; Petter and Nils, 2010; Israngkura, 2011; Meng, 2012; Yong and Mustaffa, 2013; Peansupap, 2013; Cakmak and Cakmak, 2014; Yildizel et al., 2016; Ejohwom, 2016; Charehzehi et al., 2017; Shaar et al., 2017)	Design errors due to lack of coordination	12	0.039	0.265	6
(Acharya et al., 2006; Sinha and Wayal, 2007; Ilter, 2012; Yong and Mustaffa, 2013; Cakmak and Cakmak, 2014; Farooqui and Azhar, 2014; Charehzehi et al., 2017; Shaar et al., 2017; Assaf et al., 2018)	Ambiguities in specifications	9	0.038	0.302	7
(Acharya et al., 2006; Lo et al., 2006; Petter and Nils, 2010; Meng, 2012; Yong and Mustaffa, 2013; Ejohwom, 2016; Yildizel et al., 2016; Charehzehi et al., 2017; Shaar et al., 2017)	Poor contractor and site management	9	0.038	0.339	8
(Lo et al., 2006; Israngkura, 2011; Tashi and Peansupap, 2013; Cakmak and Cakmak, 2014; Farooqui and Azhar, 2014; Mahamid, 2016; Yildizel et al., 2016; Wu et l., 2017)	Unrealistic contract duration	8	0.036	0.375	9

(Lo et al., 2006; Petter and Nils, 2010; Ilter, 2012; Yong and Mustaffa, 2013; Cakmak and Cakmak, 2014; Mahamid, 2016; Ejohwom, 2016; W et al., 2017; Assaf et al., 2018)	Inadequate competence and experience of concerned parties	9	0.033	0.409	10
(Acharya et al., 2006; Meng, 2012; Peansupap, 2013; Yong and Mustaffa, 2013; Yildizel et al., 2016; Musah et al., 2017; Shaar et al., 2017; Assaf et al., 2018)	Unavailable skilled labor	8	0.032	0.440	11
(Sinha and Wayal, 2007; Yang et al., 2009; Adnan et al., 2012; Tashi and Peansupap, 2013; Yong and Mustaffa, 2013; Elmaghri, 2014; Farooqui and Azhar, 2014; Wu et al.., 2017; Musah et al., 2017; Shaar et al., 2017)	Inconsistent goals, priorities and interests	10	0.031	0.471	12
(Sinha and Wayal, 2007; Yang et al., 2009; Petter and Nils, 2010; Adnan et al., 2012; Yong and Mustaffa, 2013; Tashi and Peansupap, 2013; Elmaghri, 2014; Farooqui and Azhar, 2014; Wu et al., 2017; Musah et al., 2017; Shaar et al., 2017; Assaf et al., 2018)	Lack of top management procedures, administration and coordination	12	0.030	0.501	13

Table 5: Significant project constraints

Project constraints	Frequency	Total score (normalized literature and industry scores)	Cumulative normalized total score	Rank
Cost	10	0.102	0.102	1
Quality	9	0.088	0.189	2
Resources	8	0.082	0.271	3
Time	7	0.062	0.332	4
Workforce productivity	4	0.060	0.393	5
Protection of environment	3	0.054	0.446	6
Safety regulations	5	0.054	0.499	7

2.6 Conflict management and dispute resolution techniques between stakeholder groups

Conflicts in construction sector has become usual and due to the involvement of diverse stakeholders, conflict is inevitable (Ng at al., 2007), in fact according to Spittler and Jentzen (1992) as long as differing opinions, interests and schedules between stakeholders remains, the enigma of conflicts and disputes in construction projects will continue to occur. Mora et al. (2003) differentiated between conflict and dispute. According to them due to contradictory or antagonistic needs conflicts are generated whereas, dispute occurs as result of difference or disagreement that requires final resolution, which is achieved by the intervention of third party but Ng et al. (2007) are in the view that it becomes the responsibility of project managers to carefully view and concentrate on averting and avoiding conflicts from developing into claims. These claims should be resolved to stop their transformation into disputes. Therefore, to avoid or lessen the intensity of such problems, different conflict management and dispute resolution techniques can play a significant role, if adopted in an efficient and effective way. Different conflict management and dispute resolution techniques are elaborated below:

2.6.1 Conflict management techniques

During conflict situation the individuals have certain different perceptions about handling the conflicts, also termed as hierarchy of responses (Hall, 1969; Blake and Mouton, 1970; Thomas Kilmann, 1974) and this hierarchy of responses called as conflict styles is usually explained in literature by many authors (Shockley, 1988) under the original concept of two dimensional model firstly presented by Blake and Mouton (1964) where they elaborated five styles of inter-personal conflicts based on two dimensions: concern for self and concern for others. Based on this concept of two dimensional behaviors many other researchers presented their models of conflict management using same dimensions plotting along with four to five conflict managing approaches (Hall, 1969; Thomas and Kilmann, 1974; Jones, 1976; Pruitt, 1983; Rahim, 1983). Figure 5 depicts amalgamated two-dimensional model for conflict management joined with different conflict styles.

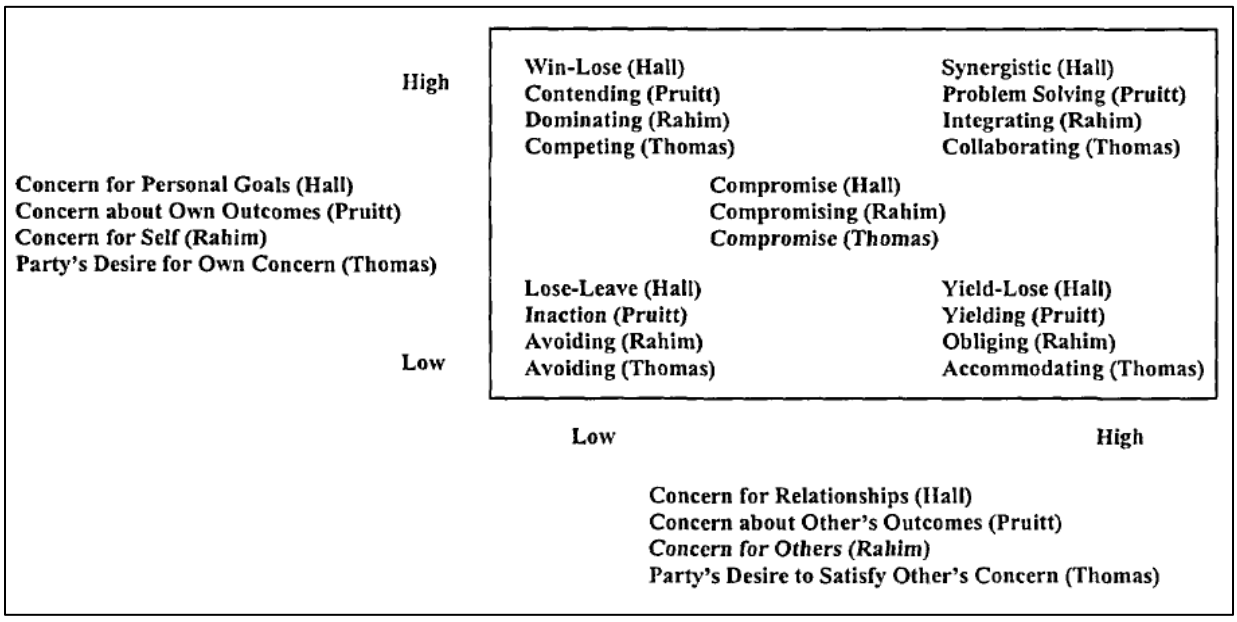


Figure 5: Two dimensional model with conflict styles (Sorenson et al., 1999)

In majority of the models presented by various researchers the concept remains the same with some variations in model dimensions: concern for self and concern for others (Sorenson et al., 1999). In the model of Thomas (1974), the two dimensions included were: contentment for one's own concerns and contentment for other's concern. The five conflict managing styles include: competing (little concern for others, high concern for self, struggling to win own goals and

objectives on the expense of others), collaborating (inclination of concern for self and others, solutions fully satisfying both), compromising (average concern for others and self, searching for mutually partial satisfying solutions to the problems), accomodating (high concern for others but little concern for self, a sense of self-sacrificing) and avoiding (little concern for other's and self, being diplomatic).

Rahim (1983)used the appraoches of Blake and Mouton (1964) and Thomas (1974) under two dimensional model: concern for others and concern for self. The five conflict handling styles include: dominating, integrating, obliging, compromising and avoiding. Consequently, the two dimensional model of Pruitt (1983) includes: concern related to other's outcomes and concern related to own's outcomes. The four conflict managing styles used were: contending, problem solving, yielding and inaction. Like other models, it depicts that the strength of model is directly linked with the strenght of concerns.

All the models indicate that conflict managing strategies are constructed as a result of joining both cocerns. From Figure 5 it can be seen that high concern for self when joined with low concen for others result dominating, win-loose, contending or competing strategies. Low self concern combined with high other's concern produce yield-loose, yielding, obliging or accomodating strategies. In similar fashion, if the concern for others and self combined are high or low, the results will have dynamic outcomes. When the concern for others and self is high then synergistic, problem solving, integrating or collaborating strategies will be produced. Subsequently, if the concern for others and self is low then along with dominating or obliging strategies, avoiding strategy is also produced. Moderate concern for others and self will generate compromising strategy. One thing that lacks in these models is the unavailability of conflict managing strategies when the dimensions are combined as low/moderate and high/moderate concerns.

In fact, according to Sorenson et al. (1999) the two dimensional models do not have the tendency to explain all possible interactions between conflict handling styles and types of concerns, therefore, in order to finalize any conflict handling style based on the strength of concerns, it is important to highlight all likely interactions between various levels of concerns.

2.6.2 Resolution of disputes between stakeholders

One of the most significant problem that project management team has to face is realization of goals, objectives and interests of stakeholders in early stages of project but due to inadequacy in the management of the stakeholder's interests, it usually result in conflicts and hostilities regarding project implementation (Olander and Landin, 2005) that if not handled with care becomes dispute and requires resolution. Fenn et al. (1997) classified dispute resolution techniques into two categories: non-binding and binding. Non-binding dispute resolution methods included: conciliation, executive tribunal and mediation whereas binding category included: adjudication, arbitration, expert determination, litigation and negotiation.

Similarly, Uher and Davenport (2002) classified dispute resolution methods into: resolution by agreement and resolution by a binding decision. Where, resolution by agreement included: negotiation, mediation. Resolution by a binding decision comprised: litigation, arbitration and expert determination. Subsequently, dispute resolution ladder concept was presented by (Findley, 1997; Mora et al., 2003)that included: prevention, partnering, standing neutral, non-binding resolution and binding resolution or litigation. Figure 6 illustrates this concept:

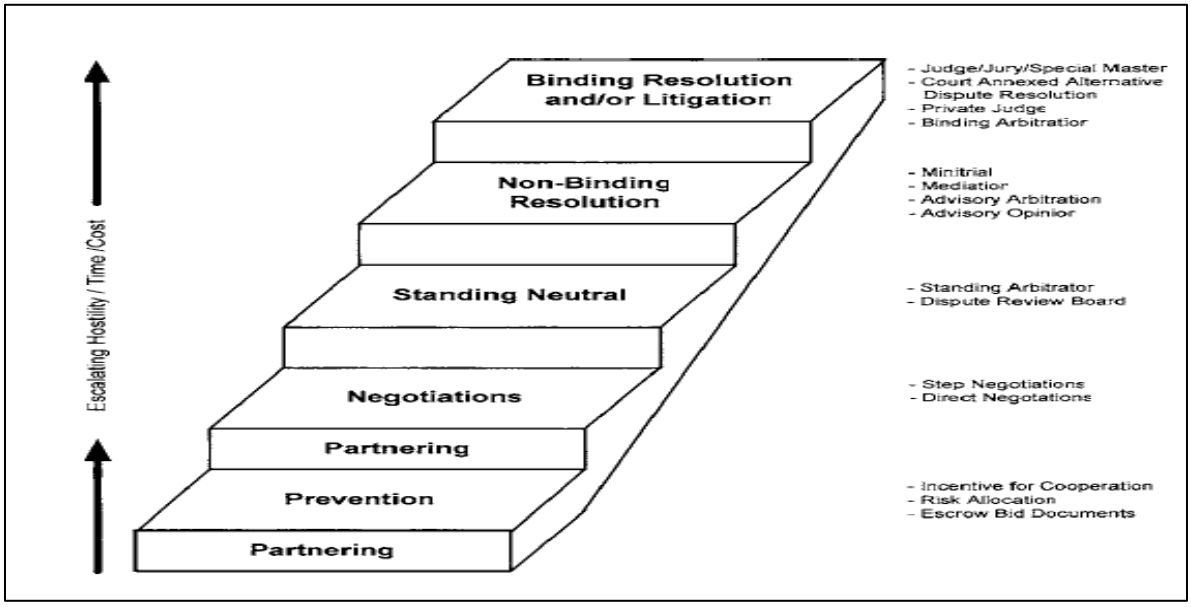


Figure 6: Dispute Resolution Ladder(Ng et al., 2007)

Binding dispute resolution comprises arbitration as the significant form (Ng et al., 2007) which is defined by Uher and Davenport (2002) as *"a legal process in which the parties who have agreed*

that they will have a dispute or disputes decided by a third party of their choice or, if they cannot agree, appointed by someone for them". Whereas non-binding dispute resolution method is the one in which disputed parties agree on mutually accepted solution with the involvement of neutral facilitator, who will help in resolving the issue, facilitator's role is advisory and non-binding which will be appointed by disputed parties with mutual consent (Ng et al., 2007).

In order to resolve the disputes quickly, negotiation technique is adopted by parties where they debate their disagreements through meetings and open dialogues, important ingredient for this process is communication and commitment for both parties to resolve disputes (Ng et al., 2007). According to Uher and Davenport (2002), in litigation process one party initiates their proceedings in a court or statutory tribunal against the other party. In simple words, anyone with the concerns can submit their claims in written form to any court or tribunal. Litigation is timely and costly procedure. Similarly, adjudication involves the appointment of a neutral person at the time of dispute to resolve it. Adjudication is similar to mediation except the decision of adjudicator is binding and it is considered as most efficient, simple and quick way to resolve disputes (Lawteacher, 2018). Subsequently, mediation is the process of solving disputes which includes an independent entity/individual to help disputed parties to reach a settlement (Hughes et al., 2015), it involves facilitative and evaluative approaches, whereas in facilitative approach, mediator facilitates the process and in evaluation/intervention approach the mediator evaluates the process along with the proposition of settlement (Ismail et al., 2010).

2.6.3 Different stakeholder's relations and their influence in project decision making

The presumptions and judgment of stakeholders, the sort of project team and stakeholder's relationship and the potential of project manager and the eagerness to efficiently administer these relationships can greatly impact the project success or failure (Manowong and Ogunlana, 2010). Considering the significance of stakeholders relationship and the way they behave in conflict situations, relationships can be classified as: unitary, pluralistic, coercive, adversarial and mutual (Rijsberman, 1999; Elmualim AA., 2006). As explained by Rijsberman (1999), in unitary relationships, all the stakeholders have alike values and there is possibility of mutual agreement on objectives but apart from this, they still can have conflicts between them. In pluralistic relationship, the stakeholders have no agreement on objectives and their values are also dissimilar, in fact one of the stakeholders has dominating powers, although stakeholders need to

trade off in their objectives and values. Similarly, in coercive relationship stakeholders do not have shared objectives and values but one of the stakeholders possesses dominating value system and impose on others with his/her powers, which will be accepted by other stakeholders. In other words, whenever there will be one stakeholder in possession of more power than others, coercive relationship among stakeholders will come to surface.

Subsequently, as stated by Elmualim (2006), in adversarial relationships, stakeholders/individuals or groups have incompatible and contradictory interests working against each other in the form of contest, competition and confrontational relationships. Whereas, in mutual relationship the stakeholders work for mutually inclusive benefits when working with each other, increasing the possibilities of success for all the stakeholders. The relationship between various stakeholders and stability of power among them is significant problem in every conflict, actually these relationships can vary from incompatible interests to disagreements on project objectives/goals to conditions where one stakeholder possess more power to impose his/her will over other stakeholders (Moura and Teixeira, 2009).

2.7 Project constraint

According to PMI (2013) a *"constraint is limiting factor that affects the execution of a project, program, portfolio, or process."*. Similarly, Mayer et al. (1995) defined constraint as a constraining situation, organization or force that restrict the performance of system in the light of provided context or surroundings. In a similar way, Lau and Kong (2006) defined constraint as anything that has the potential or capability to restrict or limit the organization or entity by hindering their movement towards attaining goals. They are in the view that constraints may result unwanted outcomes or are not supportive with organizational goals, therefore, project constraints should be monitored carefully to avoid any disturbance in the smooth flow of system.

2.7.1 Effect of stakeholder conflicts on project constraints

Construction projects normally involve substantial time and effort to finish for which several resources are used and large amount of money is spent (Chassiakos and Sakellaropoulos, 2005). In order to successfully accomplish the project objectives and avoid stakeholder conflicts, project management team must ensure that all the stakeholders are fully committed and included in decision making, requisite resources are allocated, time and cost estimates are realistic, and

project scope is manageable and administrable (Blackston et al., 2009). According to Edum and McCaffer (2000), construction project managers are responsible for project success along with delivering the project objectives specified by owners while remaining within the constraints of time, budget, quality and safety. In fact, project management becomes complicated due to varying needs and constraints of multiple stakeholders, therefore it is required to identify significant project constraints which will help in decreasing undesired wastages (Lau and Kong, 2006).

The concept of triple constraint initially included time, cost, quality and scope as prominent project constraints but an evolution has resulted into 6 factors that need to be administered and controlled in projects which are scope, quality, time, cost, risk and resources (PMI, 2013). Among these, time and cost are considered as standard because all the stakeholders assume these constraints to be their priority since it is easy to see project in terms of time and cost because of their tangible nature (Siegelaub, 2007) and time should be considered an important constraint in projects because the contingency costs pertinent to projects could be high (Olander and Landin, 2005). As a result of stakeholder conflicts and associated controversies, cost and time overruns will emerge during design and implementation stages.

Siegelaub (2007) is of the view that it is difficult for stakeholders to grasp and measure scope and quality pertinent to project but as a result of project scope variation and non-conformance of quality standards, hidden cost is considerable. However, measuring these costs is not easy despite they are present and bring damage in the form of time overruns, escalated overheads and liabilities, reduction in customers and harm to organization's image (Rosenfeld, 2009). Project scope as defined by PMI (2017) is *"the work performed to deliver a product, service, or result with the specified features and functions".* The possibility of change in stakeholder needs over time not only increases overhead cost but also brings variations in scope of project and the problem of scope changes can be eliminated if the projects are completed in time (Olander and Landin, 2005).

Project quality is actually a degree to which inborn qualities satisfy the prerequisites and specifications (PMI, 2017). And according to Rosenfeld (2009), non-conformance to quality have two types of expenditures: voluntary and involuntary. Stakeholders can regulate voluntary expenditures on will which include prevention and appraisal costs. Whereas, an unwanted

consequence of decisions made by stakeholders, involuntary costs are imposed on them which include internal and external failure costs. Focus on voluntary costs by stakeholders will save them from involuntary costs later. In fact, the cost of adopting preventive measures to avoid failures is lesser than the cost involved in rectification (Abdul-Rahman et al., 1996).

The constraints of resource and risk in projects are new and less known. Therefore, they may produce controversies among stakeholders. Their significance cannot be ignored since they are encountered in all the projects If these are neglected, intense negative effects will impact the projects and organizations (Siegelaub, 2007). In other words, these constraints persistently influence and impact each other. For better understanding and execution of projects, their inter-relations should be acknowledged.

2.7.2 Inter-relation of project constraints

According to Leach (1999), if the time allotted for the project along with fixed scope escalates, the budget will also escalate. Similarly, profit also decreases as result of time overruns, in fact there is always a tradeoff between project schedule and project budget which means reduced project durations would be possible with escalation of project cost (Steyn, 2002). If any change is occurred in one of the constraints, then there is a possibility of change in at least one other constraint, means if schedule is changed cost of project will also increase by utilizing more resources to finish that project in less time (PMI, 2008). Consequently, if allotted budget remains the same, to complete the project either scope or quality standards are compromised(PMI, 2017).

Due to differing stakeholder ideas about relative significance of project constraints, altering project objectives/goals will likely escalate project risks (Siegelaub, 2007; PMI,2013). Therefore, it is the responsibility of project management team to evaluate the situation, stabilize the demands and keep efficient communication system between all the stakeholders to hand over the project successfully (PMI, 2017).

Chapter 3

Methodology

3.1 Introduction

In order to achieve the desired research objectives, research methodology provides guidance in conducting the research. It helps researcher to highlight the relevant tools and techniques to carry out the process with the limitation of time and resources. Therefore, this chapter discusses the tools and techniques utilized in the study. Multiple techniques were used during the research process i.e. literature review, questionnaire survey, Cronbach's alpha, Shapiro-Wilk test and ordinal regression analysis.

3.2 Research strategy

In order to achieve the desired objectives of the study, questionnaire survey was conducted since it offers the advantage of covering a large population (Nkhata, 1997). And large sample sizes ensure generalization and interpretation of result for the entire population (Muya et al., 2013). To develop the survey instrument, 13 significant factors causing stakeholder's conflicts and 7 prominent project constraints in construction industry were identified through an extensive review and synthesis of literature. The stakeholder's conflicts are treated as independent variables and project constraints as dependent variables for the analysis. For each identified project constraint and factor causing stakeholder's conflicts, survey questions were designed on a 5-point Likert scale (1=no effect and 5=major effect). The questionnaire was divided into two main parts: (1) respondents' information and (2) effect of stakeholder's conflicts on project constraints in construction industry.

The sample selected for this study was randomly chosen from civil engineers of the developing countries. All three major stakeholders (client, consultant and contractor) were included in the survey. The questionnaire was floated and submitted online. But to enhance the coverage, physical copies were also distributed when visiting the respondents personally. Out of 170 invitations, 111 completed responses were received, giving a response rate of 65.3%. This sample size is larger than the minimum size of 96, ensuring representatives and significance (Shash and Abdul-Hadi, 1993; Dillman, 2000). Microsoft® Excel and SPSS® 23 were used for data analysis. Statistical tests including Cronbach's coefficient for reliability and Shapiro-Wilk

test for normality of data were performed. Cronbach's alpha measures the internal consistency and reliability of data. The numerical value for Cronbach's alpha is between 0 and 1 and identifies whether all the items in a test measure the similar concept. Before applying other tests, the validity and internal reliability of data must be ensured (Tavakol and Dennick, 2011). And finally, the effect of independent variables on dependent variables was modeled through ordinal regression analysis. Methodology flow chart for this study is given in Figure 7.

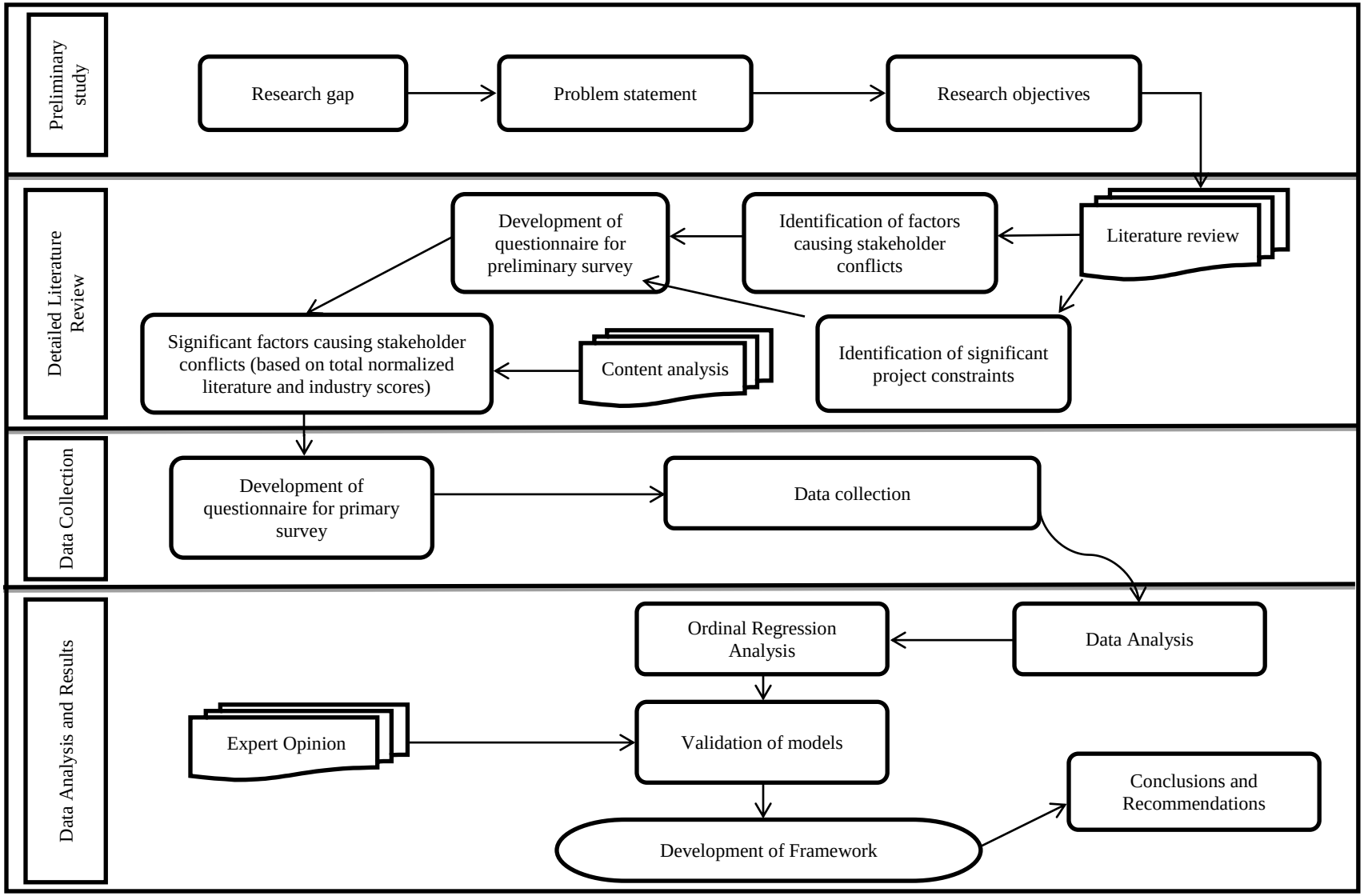


Figure 7: Research methodology flow chart

3.3 Preliminary survey

The purpose of conducting preliminary survey was to include the industry professional's input before performing content analysis. Preliminary survey questionnaire was circulated to 30 experts having industry field experience of more than 10 years. Based on the feedback of experts, industry normalized score was calculated by using mode values obtained from survey. Against weightages normalized industry and literature scores were combined. After factor comparisons, top 13 most significant factors resulting stakeholder conflicts were finalized for further analysis. Expert's demographics are shown in Table 6.

Table 6: Respondent's demographics

Organization type	**No. of responses**	**Years of experience**	**Total no.**	**Educational level**	**Total no.**
Client	7	11-15 years	15	B.Sc./B.Eng./B. Arch	17
Contractor	12	16-20 years	7	M.Sc./M.Eng./M.Arch. /P.G. Dip.	10
Sub-contractor	1	21 and above	8	PhD/D.Eng.	3
Consultant	10				
Total	**30**				

3.4 Field data

3.4.1 Regional distribution of responses

Total 111 survey responses were collected out of which 30% were national and 70% were international. Major countries participated in the survey include Pakistan, China, India, Turkey, Malaysia, Bangladesh, Jordon, Indonesia, Iran, Iraq, South Africa, Egypt, Nepal and others as shown in Figure 8. All the responses were collected from developing countries.

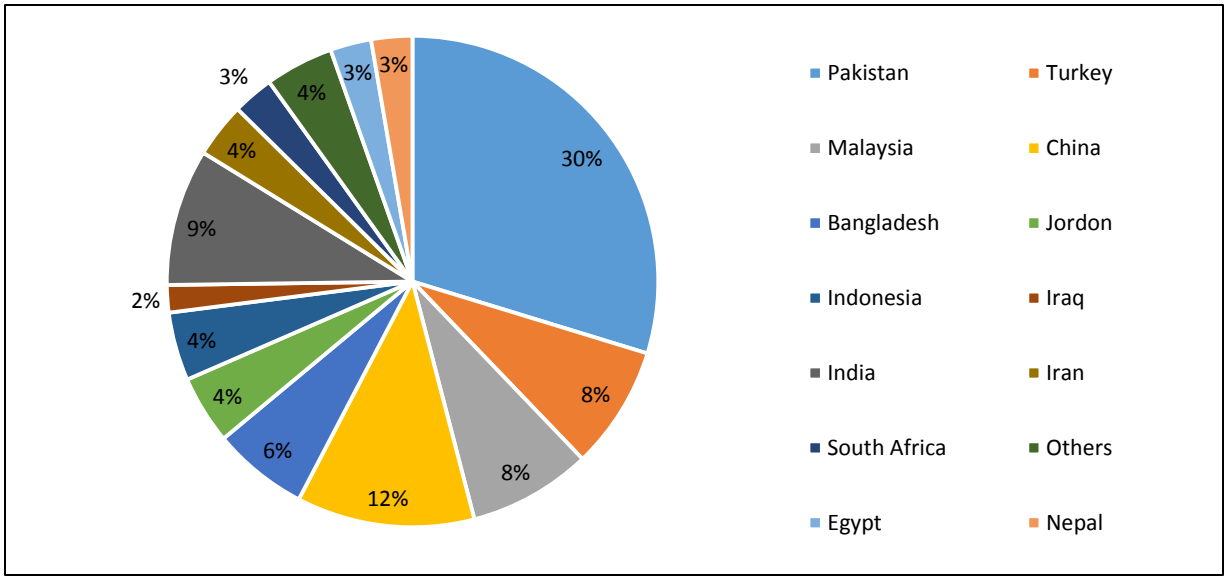


Figure 8: Regional distribution of responses

3.4.2 Respondents profile

For response collection, diverse range of construction professionals were targeted including construction/project manager, planning engineer, architect/designer, general manager, contract administrator, project engineer/site engineer and many others. The major responses were received from project managers/construction managers (28.8%) and project engineers/site engineers (28.8%). Cumulatively, 55 respondents had an experience of more than 10 years indicating that 50% responses were received from highly experienced professionals. Only 21 responses were collected form professionals with experience less than 5 years contributing only 21% responses of the total sample.

From qualification perspective, a total of 67 responses were collected from M.Sc. holders and PhD holders indicating 60% response rate from highly qualified professionals. Whereas, 40% responses were received from professionals of B.Sc./B.Eng. graduates. The questionnaire was filled by majority of professionals with high academic qualification and industry experience thus validating the reliability of their opinions. Consequently, the knowledge on stakeholder conflicts and its effects on project constraints in construction industry is significant as it reflects whether the project parties are well informed about the topic. The results show a moderate to advanced understanding of stakeholder conflicts and project constraints of professionals with 92% rate thus strengthening the confidence in quality of data. Table 7 provides comprehensive details about respondent's profiles.

Table 7: Demographic characteristics of respondents

Profile	Frequency	Percentage
Total responses = 111		
Job title		
Construction/project manager	32	29%
Project/site engineer	32	29%
Planning engineer	9	8%
Architect/designer	10	9%
General manager	6	5%
Contract administrator	10	9%
Project director	9	8%
Others	3	3%
Years of Experience		
1 to 5 years	24	22%
6 to 10 years	32	29%
11 to 15 years	17	15%
16 to 20 years	15	14%
Above 20 years	23	21%
Education		
B.Eng./ B.Sc.	44	40%
MS/M.Sc.	62	55%
PhD/D. Eng.	5	5%
Understanding of stakeholder conflicts and project constraints		
No understanding at all	2	2%
Slight	14	12%
Moderate	60	54%
Advanced	35	32%

3.5 Validity and reliability

Measuring the internal consistency and reliability of data, the value of Cronbach's alpha was 0.863. Values ranging from 0.70-0.95 are acceptable for further analysis (Tavakol and Dennick, 2011). Therefore, the data used for present study is valid and reliable. Further, to check the normality of data, Shapiro-Wilk test was performed. The results highlighted a significance value of 0.000 which is less than 0.05, which indicates that the data is not normal. For further analysis non-parametric test would be utilized. Consequently, ordinal regression analysis does not assume the data to be normal, but assumes the errors calculated by the residuals to be normal.

Chapter 4

Results and discussions

4.1 Ordinal regression analysis

Ordinal regression analysis has been used to check the effect of stakeholder's conflicts on project constraints in the construction industry and its outcomes. Against 7 project constraints, an equal number of regression models have been proposed and then a cumulative regression model has been prepared which contains the effect of all the models to see the combined effect on stakeholder's conflicts. To achieve the authentic results, few assumptions pertinent to ordinal regression should be satisfied, which include (1) measuring the response variable on ordinal level (2) parallel lines assumption meaning parallel lines have been used to check the validity of proportional odds assumption (Spais and Vasileiou, 2006) and (3) adequate cell count. It must be noted that the greater the cell with less count, the less reliable the chi-square test will be (Amstrong and Sloan, 1989). And for this, the level of the dependent variables has been reduced for which factor analysis was used as it attempts to represent a set of variables by a smaller number (Maskey et al., 2018). Varimax rotation was used to construct a simpler and interpretable factor structure by producing clearer loading patterns.

Before the model building process, the dependent variables have been reduced into three categories to make the interpretation simpler and decrease the number of zero cell counts that could affect the model fitting procedure. For this purpose, goodness of fit tests can be used to measure the adequacy of fitted models. Therefore, the test of parallel lines has been used to check the validity of the proportional odds assumption. The hypothesis under consideration for the test is,

H0: All the regression coefficients are equal for each level of response variable
H1: All the regression coefficients are not equal for each level of response variable

Likelihood ratio deviance and Pearson's chi-square statistics were used to measure the fitness of developed models (Eygu and Gulluce, 2017). The hypothesis under consideration for the test is,

H0: The model fits well to the data
H1: The model does not fit well the data

4.2 Model-1: Effect of stakeholder's conflict on cost of projects

Factor analysis indicated the rotated factor solution generated by Varimax factor rotation. The high loadings were selected according to 0.4 cut off value (Maskey et al., 2018). Factor loadings represent that how much each statement is contributed to the factor under consideration. The results in Table 8 show how the factor loadings of the statements have been clustered into four groups and a clear pattern of factor loadings can be obtained.

Table 8: Varimax rotated factor loadings for cost

Variables	Component			
	FC1	**FC2**	**FC3**	**FC4**
Inconsistent goals, priorities and interests	.755	-.159	.104	.022
Top management procedures, administration and coordination	.728	.112	.143	.147
Inadequate competence and experience of concerned parties	.723	.161	-.043	-.095
Unavailable skilled labor	.701	.184	-.052	-.122
Unrealistic contract duration	.488	-.408	.227	.156
Delay in progress payments by owner	.104	.817	.061	-.088
Inadequate and double meaning in specifications	.096	.675	.315	.103
Poor quality of completed works	.058	.624	-.040	.201
Design errors due to lack of coordination	-.006	.078	.738	-.006
Change orders and rework	.345	.000	.605	-.184
Contractual problems and errors in contractual documents	-.093	.388	.457	.296
Lack of communication between construction parties	.242	.017	-.232	.743
Poor contractor and site management	.204	-.138	-.133	-.681

Only one statement has been neglected (poor contractor and site management) from the four-factor model since it has not been significantly loaded (considering the 0.4 cut off value) to any

of the considered factors. The factors clustered into four groups were named FC1, FC2, FC3, FC4 and include:

FC1 = inconsistent goals, priorities and interests, lack of top management procedures, administration and coordination, inadequate competence and experience of concerned parties, unavailable skilled labor, unrealistic contract duration.
FC2 = delay in progress payments by owner, ambiguity in specifications, poor quality of completed works.
FC3 = design errors due to lack of coordination, change orders and rework, contractual problems and errors in contractual documents.
FC4 = lack of communication between construction parties.

As previously described, the categories of dependent variables have been reduced from 5 to 3. Frequency under each response category includes minor effect=1, neutral effect=3, major effect= 107. Since the distribution of the satisfaction level suggests that the higher categories are more probable in the response category, complementary log-log is used as link function in the ordinal regression model (Yay and Akinci, 2009). The model known as the discrete proportional hazard model is presented in Equation 1, where i=1,2,3.

$$\log[-\log(1 - Q_i)] = \alpha_i + \beta FC_1 + \beta FC_2 + \beta FC_3 + \beta FC_4 \quad \textbf{(Equation 1)}$$

Test of parallel lines, to check the validity of proportional odds assumption, indicates chi-square value = 6.020 and p-value = 0.198. The significance value is well over the preferred 5% level. Therefore, there is no statistical evidence to reject the null hypothesis. Hence the test concludes that the model holds the proportional odds assumption. Similarly, for likelihood ratio, deviance and Pearson's chi-square statistics were used to measure the fitness of the model. The results indicate p-values of 0.944 and 0.999 that are greater than 0.05 suggesting that there is no statistical evidence to reject the null hypothesis. Therefore, fitness of the model is adequate.

Table 9: Parameter estimate for cost of projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	6.137	5.842	1.103	1	.294	-5.315	17.588
Intercept=2	7.650	5.803	1.738	1	.187	-3.723	19.023
FC1	1.120	1.057	1.123	1	.289	-3.192	1.952
FC2	.796	.892	.796	1	.372	-2.545	.952
FC3	3.602	1.396	6.655	1	.10	.865	6.339
FC4	.901	.624	2.085	1	.149	-.322	2.123

From Table 9, it is evident that factors FC1, FC2, FC3 and FC4 are positively related with cost of projects. This implies that if all these factors are not handled carefully, they will directly affect the cost of construction projects. Coefficient for FC1 is 1.120 and indicates a positive relationship with cost of projects. As complementary log-log link function has been used, the magnitude of the effect of FC1 can be calculated from the odds ratio: $e^{\beta} = e^{1.120} = 3.06$. This means that if all other factors are kept constant, an increase or decrease of one unit in FC1 will cause an increase or decrease by a factor magnitude of 3.06 units in cost of projects. Inconsistent goals, inadequate competence and experience of concerned parties, unavailable skilled labor and unrealistic contract durations should be handled carefully during project execution otherwise these factors can significantly escalate project cost. Similarly, priorities and interests of stakeholders, lack of top management procedures, administration and coordination play a crucial role in project success. If the priorities and interests of stakeholders are in line with each other and the timely involvement of stakeholders is ensured, the risk of cost overrun can be effectively managed.

Subsequently, coefficients for FC2, FC3 and FC4 are 0.796, 3.602 and 0.901. Their magnitude of effects as calculated are 2.216, 36.67 and 2.46 units. From results, it is found that there is a strong relationship between FC3 and cost of projects such that cost is severely obstructed during the implementation phase because of negative attitude of stakeholders. This negative attitude develops conflicts and controversies, further complicating the relationship of stakeholders

(Olander and Landin, 2005). Additionally, design errors due to lack of coordination, change orders and rework, contractual problems and errors in contractual documents should be controlled because their minimized effect brings positive results during the course of projects. In fact, good working environment provided by clients will motivate the contractors to perform their tasks effectively (Wang and Huang, 2006). Similarly, delay in progress payments by owner, ambiguities in specifications and poor quality of completed works can significantly increase the overall project cost. Lack of communication between construction parties is considered a major driver in cost escalation. Therefore, a comprehensive and detailed communication plan can provide great source of guidance for all stakeholders. In the words of a respondent, many issues come to surface during designing and execution of wet utilities (water-related) projects. It is necessary to avoid conflicts by assigning utility corridor to each utility. It will expedite the construction activities and eliminate utility diversion costs.

4.3 Model-2: Effect of stakeholder's conflicts on quality in projects

The results in Table 10 indicate that two statements have been neglected (inadequate competence and experience of concerned parties and lack of top management procedures, administration and coordination) from the four-factor model since they have not been significantly loaded.

Table 10: Varimax rotated factor loadings for quality

Variables	Component			
	FQ1	**FQ2**	**FQ3**	**FQ4**
Change orders and rework	.838	.035	.078	-.167
Delay in progress payments by owner	.777	-.154	.151	-.194
Lack of communication between construction parties	.642	-.270	.148	.238
Contractual problems and errors in contractual documents	.599	.117	.459	.144
Design errors due to lack of coordination	.539	.224	-.054	.041
Unavailable skilled labor	-.013	.758	.263	-.064
Poor contractor and site management	.069	.745	-.126	-.117

Unrealistic contract duration	-.047	.642	-.178	.300
Inconsistent goals, priorities and interests	-.015	.486	-.301	-.110
Poor quality of completed works	.422	.090	.665	.134
inadequate competence and experience of concerned parties	-.096	.145	-.553	.001
lack of top management procedures, administration and coordination	.347	.384	-.497	.225
Inadequate and double meaning in specifications	-.050	-.069	.067	.902

The clustered factors include:

FQ1= Change orders and rework, delay in progress payments by owner, lack of communication between construction parties, contractual problems and errors in contractual documents, design errors due to lack of coordination

FQ2= Unavailable skilled labor, poor contractor and site management, unrealistic contract duration, inconsistent goals, priorities and interests

FQ3= Poor quality of completed works

FQ4= Ambiguities in specifications

Since the distribution of the satisfaction level suggests that the higher categories i.e. minor effect= 1, neutral effect= 30, major effect= 80 are more probable in the response category, the complementary log-log is used as link function in the ordinal regression model (Yay and Akinci, 2009). Therefore, the model known as the discrete proportional hazard model, is presented in Equation 2, where, i=1,2,3.

$$\mathbf{log}[-\mathbf{log}(\mathbf{1}-\boldsymbol{Q_i})] = \boldsymbol{\alpha_i} + \boldsymbol{\beta FQ_1} + \boldsymbol{\beta FQ_2} + \boldsymbol{\beta FQ_3} + \boldsymbol{\beta FQ_4} \textbf{(Equation 2)}$$

Results from test of parallel lines indicate chi-square value of 4.007 and p-value 0.405. According to these results, the significance value of the test is well over the preferred 5% level of significance. Therefore, the null hypothesis is not rejected. Hence, the test concludes that the model holds the proportional odds assumption. From deviance and the Pearson's chi-square

statistics, both tests have p-values of 0.999 which is greater than 0.05 suggesting that there is no any statistical evidence to reject the null hypothesis. Therefore, fit of the model is adequate.

Table 11: Parameter estimate for quality in projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	-4.802	2.071	5.379	1	.020	-8.860	-.744
Intercept=2	-1.176	1.822	.416	1	.519	-4.747	2.395
FQ1	-.694	.377	3.388	1	.66	-1.433	.045
FQ2	-.131	.294	.198	1	.656	-.446	.708
FQ3	-.336	.237	2.020	1	.155	-.428	.800
FQ4	-.235	.151	2.400	1	.121	-.321	.531

From Table 11, it can be seen that all the four factors FQ1, FQ2, FQ3 and FQ4 have negative relation with quality in projects. Values of coefficients for these factors are -0.694, -0.131, -0.336 and -0.235. The result highlights a strong relationship between FQ2 and quality in projects. The magnitude of FQ1, FQ2, FQ3 and FQ4 is calculated to be 0.499, 0.877, 0.715 and 0.791 units. The effect of FQ2 being greater than other factors specify that unavailable skilled labor, poor contractor and site management, unrealistic contract duration and inconsistent goals, priorities and interests impose considerable effects on quality in projects. Quality failure costs have been claimed to range up to 20% of the original contract value of projects (Love et al., 2017). Flexible contract conditions, poor coordination and lack of expertise have a negative impact on projects cost, quality and construction schedules. Moreover, contract documents and design specification must be well-defined and clearly spelled out for smooth running of the construction projects.

4.4 Model-3: Effect of stakeholder's conflicts on resources used in projects

The results in Table 12 identity that only one statement have been neglected i.e. ambiguities in specifications from the five-factor model since they have not been significantly loaded.

Table 12: Varimax rotated factor loadings for resources

Variables	Component				
	FR1	**FR2**	**FR3**	**FR4**	**FR5**
Poor contractor and site management	.774	-.095	.074	.072	-.084
Inadequate competence and experience of concerned parties	.693	-.086	.077	.192	.195
Top management procedures, administration and coordination	.674	.173	.103	-.212	.072
Contractual problems and errors in contractual documents	-.201	.740	.114	.128	.041
Design errors due to lack of coordination	.099	.718	.104	.137	.175
Poor quality of completed works	.069	.580	.188	.324	.063
Inconsistent goals, priorities and interests	.099	.157	.822	-.089	.133
Unrealistic contract duration	.226	.258	.711	.126	-.116
ambiguities in specifications	.442	.463	-.515	-.137	-.095
Change orders and rework	.080	.128	.144	.807	-.004
Lack of communication between construction parties	-.044	.280	-.121	.688	.100
Unavailable skilled labor	.390	.061	.107	-.165	.765
Delay in progress payments by owner	-.177	.224	-.036	.349	.715

The grouped factors include:

FR1= Poor contractor and site management, inadequate competence and experience of concerned parties, lack of top management procedures, administration and coordination

FR2= Contractual problems and errors in contractual documents, design errors due to lack of coordination, poor quality of completed works

FR3= Inconsistent goals, priorities and interests, unrealistic contract duration

FR4= Change orders and rework, lack of communication between construction parties

FR5= Unavailable skilled labor, delay in progress payments by owner

Distribution of the satisfaction level indicates that the higher categories are more probable in the response category i.e. minor effect= 14, neutral effect= 41 and major effect= 56, the complementary log-log is used as link function in the ordinal regression model (Yay and Akinci, 2009). Therefore, discrete proportional hazard model is presented in Equation 3, where i= 1,2,3.

$$\log[-\log(1-Q_i)] = \alpha_i + \beta FR_1 + \beta FR_2 + \beta FR_3 + \beta FR_4 + \beta FR_5 \text{(Equation 3)}$$

Test of parallel lines indicate chi-square and p-value to be 0.792 and 0.978. The significance value of the test is well over the preferred 5% level of significance. Therefore, null hypothesis is retained. Hence, the model holds the proportional odds assumption. The results produced by the deviance and the Pearson's chi-square have p-values 0.174 and 0.325, which are greater than 0.05 suggesting that the null hypothesis is not rejected. Therefore, fit of the model is adequate.

Table 13: Parameter estimate for resources used in projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	.735	1.420	.268	1	.605	-2.047	3.518
Intercept=2	2.408	1.417	2.888	1	.089	-.369	5.186
FR1	.222	.217	1.046	1	.306	-.203	.647
FR2	.068	.250	.074	1	.785	-.557	.421
FR3	.032	.208	.024	1	.876	-.439	.375
FR4	.378	.183	4.287	1	.058	.420	.737
FR5	.182	.233	.607	1	.436	-.275	.639

From Table 13, it is concluded that all the five factors FR1, FR2, FR3, FR4 and FR5 have positive relation with resources used in projects. They have coefficient values 0.222, 0.068, 0.032, 0.378 and 0.182. There is a robust relationship between FR4 and resources used in projects. The magnitudes of these factors as calculated are 1.249, 1.073, 1.032, 1.459 and 1.199 units. Change orders and rework and lack of communication between construction parties as evident from results significantly escalate the resource usage in projects if these are not controlled. Resource discrepancies leads to intense problems in the life of project. When the

available resources are not aligned with the schedule of involved activities, contractors will try to exploit the master schedule of project in order to accommodate their preferences. This will cause conflicts between stakeholders because where the resource constraint is coupled with time constraint, any change in schedules will directly affect the tasks of other contractors (Ramón and Cristóbal, 2015). The situation becomes even more challenging when managers are responsible for multiple projects with excessively constrained resources. They have to implement decisions in order to reduce the daily delays per project or time to complete the whole project (Browning and Yassine, 2010). Their competency will save the projects from conflicts.

4.5 Model-4: Effect of stakeholder's conflicts on time in projects

From Table 14, only one statement i.e. inadequate competence and experience of concerned parties has been neglected from the four-factor model since they have not been significantly loaded with 0.4 cut-off value.

Table 14: Varimax rotated factor loadings for time

Variables	Component			
	FT1	**FT2**	**FT3**	**FT4**
Change orders and rework	.844	.075	.243	.233
Contractual problems and errors in contractual documents	.765	.139	.024	-.340
Delay in progress payments by owner	.700	.147	.257	.355
Design errors due to lack of coordination	.543	.267	-.413	-.001
Inconsistent goals, priorities and interests	-.012	.846	.113	.007
Top management procedures, administration and coordination	.288	.740	-.046	-.031
Unavailable skilled labor	.220	.665	-.256	-.083
Inadequate and double meaning in specifications	.029	.585	.212	.010

inadequate competence and experience of concerned parties	.103	.119	-.774	.160
Unrealistic contract duration	.239	.107	.688	.053
Poor contractor and site management	.235	.269	.546	.201
Poor quality of completed works	.011	.063	-.065	.817
Lack of communication between construction parties	.057	-.100	.047	.571

The grouped factors are:

FT1= Change orders and rework, contractual problems and errors in contractual documents, delay in progress payments by owner, design errors due to lack of coordination

FT2= Inconsistent goals, priorities and interests, lack of top management procedures, administration and coordination, unavailable skilled labor, ambiguities in specifications

FT3= Unrealistic contract duration, poor contractor and site management

FT4= Poor quality of completed works, lack of communication between construction parties

According to Yay and Akinci (2009), complementary log-log is used as link function in the ordinal regression model because distribution of the satisfaction level suggests that the higher categories are more probable in the response category. Frequency for each response category include: minor effect= 2, neutral effect= 24 and major effect= 85. Again, discrete proportional hazard model is used and shown in Equation 4, where i= 1,2,3.

$$\log[-\log(1-Q_i)] = \alpha_i + \beta FT_1 + \beta FT_2 + \beta FT_3 + \beta FT_4 \qquad \textbf{(Equation 4)}$$

Chi-square and p-value is 5.084 and 0.214 after performing parallel lines test. It can be seen from results that the significance value of the test is well over the preferred 5% level of significance. Therefore, there is no any statistical evidence to reject the null hypothesis. Hence the test concludes that the model holds the proportional odds assumption. Deviance and the Pearson's chi-square statistic have p-values 0.05 and 0.999 and both tests have p-values greater than 0.01 suggesting that there is no any statistical evidence to reject the null hypothesis. Therefore, fit of the model is adequate.

Table 15: Parameter estimate for time in projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	-3.392	2.832	1.435	1	.231	-8.943	2.158
Intercept=2	-.680	2.750	.061	1	.805	-6.071	4.711
FT1	.227	.353	.414	1	.520	-.919	.465
FT2	.270	.370	.532	1	.466	-.996	.456
FT3	.288	.381	.573	1	.449	-1.035	.458
FT4	.892	.493	3.272	1	.070	-.074	1.858

From Table 15, all the factors i.e. FT1, FT2, FT3 and FT4 show positive relation with time constraint, means increasing or decreasing one will directly affect the time in projects. The coefficient values for these factors are 0.227, 0.270, 0.288 and 0.892. The results indicate that the relationship between FT4 and time in projects is strong. The magnitude of these factors is 1.255, 1.309, 1.334 and 2.440 units. Poor quality of completed works and lack of communication between construction parties effect the stipulated time in projects because compromising the quality standards will increase the amount of work. Poor feedback system and weak flow of information about the project between construction parties will obstruct the smooth flow of construction activities. Subsequently, unrealistic contract duration and poor contractor and site management also complicate the state of affairs if neglected during the life of project. Additionally, these conflicts cause delays and interruptions during the implementation phase or even results in project suspension (Acharya et a., 2006). Specifications and drawings go hand in hand. But unfortunately, during design one document is modified while neglecting the other. Similarly, contract document often does not efficiently define and outline the amount of work to be performed. According to Fisk (2000), it generates conflict between stakeholders, which is termed as scope of wok disputes.

4.6 Model-5: Effect of stakeholder's conflicts on workforce productivity in projects

In Table 16, only one statement i.e. change orders and rework has been neglected from the four-factor model after factor analysis, since they have not been significantly loaded considering the 0.4 cut off value to any of the factors considered.

Table 16: Varimax rotated factor loadings for workforce productivity

Variables	Component			
	FW1	**FW2**	**FW3**	**FW4**
Inadequate and double meaning in specifications	.887	-.175	-.168	.036
Poor contractor and site management	.845	-.130	.222	-.111
Design errors due to lack of coordination	.684	.384	.036	-.148
Change orders and rework	.399	.211	.131	.330
Top management procedures, administration and coordination	-.056	.735	.102	-.175
Contractual problems and errors in contractual documents	-.078	.706	-.048	.288
Delay in progress payments by owner	.339	.610	-.152	.172
Inconsistent goals, priorities and interests	-.195	.550	.326	.138
Unavailable skilled labor	-.124	.230	.803	-.100
Inadequate competence and experience of concerned parties	.125	.130	.734	-.197
Unrealistic contract duration	.161	-.352	.659	.374
Poor quality of completed works	-.208	.039	.016	.859
Lack of communication between construction parties	.119	.084	-.141	.619

The clustered factors include:

FW1= Ambiguities in specifications, poor contractor and site management, design errors due to lack of coordination

FW2= Lack of top management procedures, administration and coordination, contractual problems and errors in contractual documents, delay in progress payments by owner, inconsistent goals, priorities and interests

FW3= Unavailable skilled labor, inadequate competence and experience of concerned parties, unrealistic contract duration

FW4= Poor quality of completed works, lack of communication between construction parties

Since the distribution of the satisfaction level suggests that the higher categories are more probable in the response category i.e. minor effect= 8 and major effect= 103, the complementary log-log is used as link function in the ordinal regression model (Yay and Akinci, 2009). Therefore, the model is known as the discrete proportional hazard model and presented in Equation 5, where i= 1,2,3.

$$\mathbf{log}[-\mathbf{log}(\mathbf{1}-\boldsymbol{Q_i})] = \boldsymbol{\alpha_i} + \boldsymbol{\beta FW_1} + \boldsymbol{\beta FW_2} + \boldsymbol{\beta FW_3} + \boldsymbol{\beta FW_4} \qquad \textbf{(Equation 5)}$$

After running parallel lines test, chi-square value and p-value is 2.613 and 0.625. According to the results, it can be seen that the significance value of the test is well over the preferred 5% level of significance. Therefore, null hypothesis is retained. Hence the test concludes that the model holds the proportional odds assumption. Consequently, the results produced by the deviance and the Pearson's chi-square statistics show p-values of 0.023 and 0.999. Both tests have p-values greater than 0.01 suggesting that there is no any statistical evidence to reject the null hypothesis. Therefore, fit of the model is adequate.

Table 17: Parameter estimate for workforce productivity in projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	-4.631	3.843	1.452	1	.228	-12.164	2.901
FW1	-.349	.395	.783	1	.376	-.425	1.123

FW2	-.286	.662	.187	1	.665	-1.012	1.585
FW3	-.906	.708	1.637	1	.201	-2.294	.482
FW4	-.134	.512	.068	1	.794	-1.137	.870

The results from Table 17 highlight a negative relation of all four factors i.e. FW1, FW2, FW3 and FW4 with workforce productivity. It means that if there is any decrease in the effect of these factors, workforce productivity will in turn increase. The coefficient values for these factors are -0.349, -0.286, -0.906 and -0.134. The magnitude of effect for these factors as calculated is 0.705, 0.751, 0.404 and 0.875. From these values it can be incurred that there is a strong relationship between FW4 and workforce productivity. It means if the magnitude of poor quality of completed works and lack of communication between construction parties in projects is increased by one unit, the workforce productivity will decrease by 0.875 units and vice versa. The true success and efficiency of projects heavily depends on labor productivity (Jarkas, 2015). And it is regarded as a key driver in construction, in fact in most of the countries it constitutes up to 50% of overall project cost (Kazaz et al., 2008). Due to frequent change orders and rework during the execution of projects, it slows down the work progress until the requests for clarification are addressed by the respective engineer. This results in considerable revisions in documents. These consequences along with increased on-site visits and inspections by engineer generates frustration, demotivation and dissatisfaction in labors, which would affect the labor efficiency and productivity. Poor quality of completed works leads to technical faults. Unskilled labor will increase the scope of work due to workmanship errors. Obstructions in the flow of information and poor feedback system in projects generate communication gap between staff at site and in office.

4.7 Model-6: Effect of stakeholder's conflicts on protection of environment in projects

The results in Table 18 highlights that no statements have been neglected from the three-factor model since all the statements have been significantly loaded.

Table 18: Varimax rotated factor loadings protection of environmnet

Variables	Component		
	FE1	**FE2**	**FE3**
Delay in progress payments by owner	.825	.126	.100
Design errors due to lack of coordination	.775	.105	.270
Change orders and rework	.735	.417	.140
Inadequate and double meaning in specifications	.734	.043	.167
Unavailable skilled labor	.684	.122	.427
Top management procedures, administration and coordination	.033	.859	.094
Contractual problems and errors in contractual documents	.250	.710	.139
Poor quality of completed works	.329	.702	.230
Inconsistent goals, priorities and interests	.003	.627	.282
Poor contractor and site management	.210	.273	.735
Unrealistic contract duration	.425	.008	.698
Inadequate competence and experience of concerned parties	.049	.444	.698
Lack of communication between construction parties	.216	.169	.562

The factors grouped together on their characteristics include:

FE1= Delay in progress payments by owner, design errors due to lack of coordination, change orders and rework, ambiguities in specifications, unavailable skilled labor

FE2= Lack of top management procedures, administration and coordination, contractual problems and errors in contractual documents, poor quality of completed works, inconsistent goals, priorities and interests

FE3= Poor contractor and site management, unrealistic contract duration, inadequate competence and experience of concerned parties, lack of communication between construction parties

Higher categories i.e. minor effect= 16, neutral effect= 42 and major effect= 53 are more probable in the response category in distribution of satisfaction level, the complementary log-log is used as link function in the ordinal regression model (Yay and Akinci, 2009). Hence, discrete proportional hazard model is presented in Equation 6, where i= 1,2,3.

$$\log[-\log(1-Q_i)] = \alpha_i + \beta FE_1 + \beta FE_2 + \beta FE_3 \qquad \textbf{(Equation 6)}$$

From parallel lines test the result for chi-square and p-value is 5.392 and 0.145. The significance value of the test is well over the preferred 5% level of significance. Therefore, there is no any statistical evidence to reject the null hypothesis. Hence the test concludes that the model holds the proportional odds assumption. Similarly, p-values obtained from deviance and the Pearson's chi-square statistics are 0.043 and 0.048. Both tests have p-values greater than 0.01 suggesting that there is no any statistical evidence to reject the null hypothesis. Therefore, fit of the model is adequate.

Table 19: Parameter estimate for protection of environment in projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	-3.165	.966	10.735	1	.001	-5.058	-1.272
Intercept=2	-1.582	.936	2.859	1	.091	-3.416	.252
FE1	-.169	.220	.592	1	.442	-.600	.262
FE2	-.177	.207	.728	1	.394	-.229	.583
FE3	-.329	.242	1.844	1	.174	-.805	.146

Table 19 shows that all the factors FE1, FE2 and FE3 have negative relationship with protection of environment in projects. Values of their coefficients are -0.169, -0.177 and -0.329. The magnitude of effect for these factors are 0.845, 0.838 and 0.719. It means that delay in progress payments by owner, design errors due to lack of coordination, change orders and rework, ambiguities in specifications and unavailable skilled labor if not checked and controlled in time,

these will gravely affect the environment of projects that includes both the working environment and surrounding nature. Before initiating the project, environmental analysis is very essential. As it will lay down the rules, regulations and principles to follow during the course of construction. These procedures will save the project from unnecessary stakeholder conflicts. The environmental assessment will highlight the protection of water, land, air, plants, animals and other natural resources from construction activities [ER 415-1-11 (USACE, 1994)]. The processes of biddability, constructability, operability and environmental protection should be ensured for minimizing the effects of claims, disputes and conflicts. Because verifying these will increase the capability of improved communication. As the effective communication is a robust tool in making the project a success (Ogburn and El-adaway, 2013). Flow of information to all the stakeholders, employing skilled labor at site, timely correction of design errors will save the project from conflicts and enhance the working environment.

4.8 Model-7: Effect of stakeholder's conflicts on safety regulations in projects

The high loadings were selected according to 0.4 cut off value by the rotated factor solution generated by Varimax factor rotation. According to the results in Table 20, no statements have been neglected from the four-factor model.

Table 20: Varimax rotated factor loadings safety regulations

Variables	Component			
	FS1	**FS2**	**FS3**	**FS4**
Design errors due to lack of coordination	.774	.025	.243	.078
Contractual problems and errors in contractual documents	.741	.413	-.252	-.009
Delay in progress payments by owner	.728	.100	.382	-.348
Top management procedures, administration and coordination	.651	.134	.497	-.014
Inadequate and double meaning in specifications	.651	.171	.150	.291
Unavailable skilled labor	.636	.308	.147	.213

Lack of communication between construction parties	-.054	.763	.147	-.063
Change orders and rework	.397	.698	-.107	.100
Inconsistent goals, priorities and interests	.312	.682	.342	.114
Poor quality of completed works	.315	.556	-.145	-.456
Inadequate competence and experience of concerned parties	.187	.523	.424	.403
Poor contractor and site management	.222	.098	.823	.028
Unrealistic contract duration	.154	.032	-.010	.789

The factors grouped together are:

FS1= Design errors due to lack of coordination, contractual problems and errors in contractual documents, delay in progress payments by owner, lack of top management procedures, administration and coordination, ambiguities in specifications, unavailable skilled labor

FS2= Lack of communication between construction parties, change orders and rework, inconsistent goals, priorities and interests, poor quality of completed works, inadequate competence and experience of concerned parties

FS3= Poor contractor and site management

FS4= Unrealistic contract duration

The distribution of the satisfaction level suggests that the higher categories. Frequency of responses include: minor= 10, neutral= 38 and major= 63. In the response category, the complementary log-log is used as link function in the ordinal regression model (Yay and Akinci, 2009). Therefore, the model is known as the discrete proportional hazard model and shown in equation 7, where i= 1,2,3.

$$\mathbf{log}[-\mathbf{log}(\mathbf{1}-\boldsymbol{Q_i})] = \boldsymbol{\alpha_i} + \boldsymbol{\beta FS_1} + \boldsymbol{\beta FS_2} + \boldsymbol{\beta FS_3} + \boldsymbol{\beta FS_4} \textbf{(Equation 7)}$$

From parallel lines test, chi-square value and p-value is 4.013 and 0.404. It can be seen that the significance value of the test is well over the preferred 5% level of significance. Therefore, null hypothesis is not rejected. Hence, the test concludes that the model holds the proportional odds

assumption. Similarly, p-values obtained from Deviance and the Pearson's chi-square statistics are 0.014 and 0.063. Both tests have p-values greater than 0.01 suggesting that there is no any statistical evidence to reject the null hypothesis. Therefore, fit of the model is adequate.

Table 21: Parameter estimate for safety regulations in projects

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound
Intercept=1	-3.426	1.151	8.859	1	.003	-5.681	-1.170
Intercept=2	-1.573	1.114	1.995	1	.158	-3.757	.610
FS1	-.639	.263	5.913	1	.015	-1.155	-.124
FS2	-.380	.247	2.363	1	.124	-.105	.865
FS3	-.022	.182	.014	1	.905	-.334	.377
FS4	-.019	.024	.650	1	.420	-.066	.027

From Table 21 it is concluded that all the four factors FS1, FS2, FS3 and FS4 are negatively linked with safety in projects. Coefficient values for these factors are -0.639, -0.380, -0.022 and -0.019. Their magnitudes as calculated from coefficient values are 0.528, 0.684, 0.978 and 0.981. From the results it can be viewed that FS3 and FS4 strongly affect safety in construction projects if not managed properly. Unrealistic contract duration generates a pressurized working environment where workmanship is expected to complete the tasks as soon as possible. As a result of this rush, safety in projects will be ignored. Consequently, poor contractor and site management also leads to safety problems because the majority of contractor's mentality is to accomplish the given tasks and to make their daily progress graph higher without giving any importance to safety standards. Additionally, safety regulations should be agreed upon by all the stakeholders. So that during the project execution, roles and responsibilities should be clear to avoid superfluous conflicts.

4.9 Model 8: Cumulative ordinal regression model

For the variable selection procedure, the backward elimination method was applied initially. The model was fitted with only considering the main effects to obtain a simpler model. 5% level of

significance has been used in selecting the factors into the model. All the factors meeting the criteria clustered together include:

FC3= Design errors due to lack of coordination, change orders and rework, contractual problems and errors in contractual documents
FR5= Unavailable skilled labor, delay in progress payments by owner
FT1= Change orders and rework, contractual problems and errors in contractual documents, delay in progress payments by owner, design errors due to lack of coordination
FT2= Inconsistent goals, priorities and interests, lack of top management procedures, administration and coordination, unavailable skilled labor, ambiguities in specifications
FE1= Delay in progress payments by owner, design errors due to lack of coordination, change orders and rework, ambiguities in specifications, unavailable skilled labor
FE2= Lack of top management procedures, administration and coordination, contractual problems and errors in contractual documents, poor quality of completed works, inconsistent goals, priorities and interests
FS2= Lack of communication between construction parties, change orders and rework, inconsistent goals, priorities and interests, poor quality of completed works, inadequate competence and experience of concerned parties
FW4= Poor quality of completed works, lack of communication between construction parties

The final cumulative regression model suggested is presented in Equation 8, where i= 1,2,3.

$$\mathbf{log}[-\mathbf{log}(\mathbf{1}-\boldsymbol{Q_i})] = \boldsymbol{\alpha_i} + \boldsymbol{\beta FC_3} + \boldsymbol{\beta FR_5} + \boldsymbol{\beta FT_1} + \boldsymbol{\beta FT_2} + \boldsymbol{\beta FE_1} + \boldsymbol{\beta FE_2} + \boldsymbol{\beta FS_2} + \boldsymbol{\beta FW_4}$$

(Equation 8)

The results produced by the deviance and the Pearson's chi-square statistics show p-values 0.989 and 0.999. Both the tests have p-values greater than 0.05 suggesting that the null hypothesis is retained. Therefore, fit of the model is adequate.

Table 22: Parameter estimate for cumulative ordinal regression model

Parameter	Estimate	Standard error	Wald	Df	P-value	95% confidence interval	
						Lower bound	Upper bound

Intercept=2	-25.140	12.491	4.051	1	.044	-49.622	-.658
FC3	-2.754	1.377	3.999	1	.046	-5.453	-.055
FR5	1.880	.866	4.706	1	.030	.181	3.578
FT1	.491	.770	.406	1	.524	-1.019	2.000
FT2	-4.230	1.906	4.925	1	.026	-7.967	-.494
FW4	2.677	1.011	7.005	1	.008	.695	4.660
FP1	-5.798	2.250	6.640	1	.010	-10.208	-1.388
FP2	-1.721	.848	4.122	1	.042	-3.382	-.060
FS2	4.851	1.857	6.825	1	.009	1.212	8.490

Table 22 present results of cumulative effect of the factors of stakeholder's conflicts on all project constraints. Here, the magnitude of these factors on project constraints has greater significance. It will highlight all those factors which pose intense effects. The odds of magnitudes for these factors are 0.064, 6.554, 1.634, 0.0145, 14.541, 0.003, 0.179 and 127.879 units. From these results, it can be seen clearly that FS2 has immensely powerful relationship with project constraints as compared to other factors. Similarly, FW4 and FR5 has also strong relation with project constraints but much less than FS2. Sometimes, compromising quality standards may lead to complete structure failures. On construction sites, errors due to ignorance of quality standards are frequent and can severely affect cost and time of projects. Accordingly, safety regulations, workforce productivity and environmental protection will be sabotaged along with the wastage of resources. Subsequently, poor communication between project stakeholders can be frustrating in construction projects because it will result in poor performance, insufficient team work, little morale and decreased profits. Another perspective is developed from the above results that repetition of change orders and rework is maximum in Equation 8, indicating its significance in construction projects. Taking the average of its magnitude values, the result is 4.105 units. For lack of communication between construction parties the average value is 64.029 units. Similarly, for poor quality of completed works average value is 42.687 units. In other words, lack of communication between construction parties, poor quality of completed works and change orders and rework are the key factors gravely effecting all project constraints in construction industry. Table 23 shows a detailed summary in the form of framework. The most important factors according to their odds ratio values have been highlighted. It can be seen from

the results that lack of communication between construction parties is consistently repeating in different models highlighting its significance as compared to other factors. The average odds ration value for lack of communication between construction parties depending on its repetition is 64.029 units, followed by poor quality of completed works (42.687 units) and change orders and rework (4.150). These three factors should be given priority in order to minimize their effects on project constraints. Additionally, the pseudo R square value suggest that only 61% of variance have been explained by the independent variables. Thus, suggesting the inclusion of other stakeholder conflicting factors for enhancing the results.

Table 23: Framework

Models	**Odds Ratio Value (maximum magnitude)**		**Significant Factors**	
Model-1 Cost	FC3= 36.67	**Direct Relationship**	Design errors due to lack of coordination, change orders and rework, contractual problems and errors in contractual documents	
Model-2 Resource	FR4= 1.459		Change orders and rework, lack of communication between construction parties	
Model-3 Time	FT4= 2.440		Poor quality of completed works, lack of communication between construction parties	
Model-4 Quality	FQ2= 0.877	**Inverse Relationship**	Unavailable skilled labor, poor contractor and site management, unrealistic contract duration, inconsistent goals, priorities and interests	
Model-5 Workforce Productivity	FW4= 0.875		Poor quality of completed works, lack of communication between construction parties	
Model-6 Protection of Environment	FE1= 0.845		Delay in progress payments by owner, design errors due to lack of coordination, change orders and rework, ambiguities in specifications, unavailable skilled labor	
Model-7 Safety Regulations	FS4= 0.981		Unrealistic contract duration	**Factors Requiring Greater Attention due to their Repetition in final Model**
Cumulative Model	FS2= 127.88		Lack of communication between construction parties, change orders and rework, inconsistent goals, priorities and interests, poor quality of completed works,	*-Lack of communication between construction parties (Avg. odds ratio value= 64.029)*

			inadequate competence and experience of concerned parties	*-Poor quality of completed works (Avg. odds ratio value= 42.687)* *-Change orders and rework (Avg. odds ratio value= 4.105)*
	FW4= 14.54		Poor quality of completed works, lack of communication between construction parties	
	FR5= 6.55		Unavailable skilled labor, delay in progress payments by owner	

Chapter 5

Conclusion and recommendations

5.1 Conclusion

Stakeholder relationships play a vital role in the successful execution of the projects. All the issues related to stakeholders should be considered at every stage of project and maintain a robust coordination between them. Proper coordination is required to avoid the negative effects on the project at any phase of construction. Proper planning and understanding of the work and scope would be helpful in resolving issues and conflicts before or during the execution of projects. A neutral monitoring authority from client side to act as an umpire for the betterment of project must be there to guard against the client representative's inefficiency or slackness as they often blame contractor's staff. Obligations and liabilities of the parties must be clear and pre-defined in the contract document and must be followed during execution to avoid or ameliorate conflicts.

Exact scope of work should be quantified, mentioned in work order and locked for any undue variation and wish list culture needs to be finished. Usually such wishes are raised while the contractor is deeply involved in execution of works and "do-redo" are demanded by the client or consultant without considering extra cost and time. Optimization is necessary in each of the constraints. Design and specifications should be followed and everything should be realistic. Contracts should be awarded to the competent contractors. Proper design should be followed instead of amended conventional drawings. Contract documents and design specifications must be well-defined and clearly spelled out for the smooth running of construction projects. Conflicts must be set aside to create a win-win situation. Time, cost and quality are the main factors playing a major role, effecting the progress of projects. Unrealistic and ill prepared baseline, deliverables delay and poor engineering create antagonistic environments on construction sites.
Stakeholders should have a proper and timely communication. Communication between stakeholders is important. Poor communication can lead to project disasters. Communication must be clear and competent stakeholders must be selected. Policy and procedure must be established without dubious statements.Lack of communication is major factor effecting stakeholder's relationship. Project managers shall be part of the project from the planning phase

all the way till the execution to avoid hurdles. Communication gap between parties should be filled. Top management bodies should lead the project. To avoid the conflicts, close coordination among stakeholders should be ensured. Grievance redressal committee should be established to minimize the conflicts.

Weekly meetings should be arranged for resolution of any conflicts between stakeholders. Timely decisions and release of payments as per contractual time will result in timely delivery of project. Also, quality of work is the main concern of the clients which usually is not up to the mark in developing countries and eventually results in delays in handing over to the customer and client have to spend an additional overhead and renovation charge. Moreover, processing of final payment certificate and release of retention money is delayed resulting in conflicts between stakeholders. Until so far stakeholder conflicts have caused negative consequences for the construction projects. This is particularly the case with government funded projects as for example the poor quality of communication among various stakeholders cause great damage to the cost and quality of government owned projects.

Another significant stakeholder conflict observed is payment issue. Most of the time client fails to fulfill his payment commitments resulting in delays of project. Unfortunately, in developing countries, contractor is not considered as a business partner but a burglar. When the client will consider him as a business partner and will fulfill his payment commitments according to contract, the level of project deliverance on time with quality will be increased. And the major conflict which arises on every project between two major stakeholders will be minimized. Consequently, in most of the developing countries construction environment, the goals and objectives of all stakeholders are not coherent. Clients usually join the project for having huge commissions in the form of illegal money and to make their political bosses happy. Consultants are having high fear of audit authorities which curb them to make proactive decisions. Contractor is there with highly non-professional behavior just to maximize his desired profits compromising quality and progress etc. Engineering Councils and other engineering bodies need to sit together for having a coherent approach to raise the professional standards in engineering projects.

Stakeholder's conflicts are not always bad; conflict must be resolved by observing every aspect relevant to it as well as must involve the stakeholders to identify best solution for conflicts. Conflict can be fruitful and between various involved parties, it gives the learning and

improvement opportunity so it has positive impact, if it is limited. Professionally dealing with project constraints lead to project success. Various stakeholder conflicts could be turned into opportunities of more innovative and informed decision-making processes by improving upon all the constraints.

5.2 Recommendations

The pseudo R square value of 61% indicates the percentage of variance explained by included independent variables. Therefore, to enhance the results, other factors causing stakeholder's conflicts in construction industry should be included in future studies. Additionally, only developing countries were targeted in this study. For future research, the prospect of this topic should be tested in developed countries as well. And their difference should be noted.

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