SUBCONTRACTING PRACTICES IN CONSTRUCTION INDUSTRY OF PAKISTAN

Thesis of

Master of Science

by

Muhammad Arshad

Department of Construction Engineering and Management

National Institute of Transportation

School of Civil and Environmental Engineering

National University of Sciences and Technology

Islamabad, Pakistan

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By

Muhammad Arshad

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This is to certify that the

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Dr. Hamza Farooq Gabriel

Department of Construction Engineering and Management

National Institute of Transportation

School of Civil and Environmental Engineering

National University of Sciences and Technology, Islamabad

DEDICATED

TO MY PARENTS, FAMILY, TEACHERS

AND

COLLEAGUES

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ABSTRACT

Subcontracting on construction projects is a common and well-established practice. Contractors enlist the services of subcontractors to achieve certain objectives, including obtaining cost reductions, securing access to specialized services, and risk sharing. Nonetheless, subcontracting on a project can introduce certain associated problems which can affect construction management and construction quality. This research explored the subcontracting practices in the construction industry of Pakistan, identified the main problem areas, examined the overall satisfaction with the quality of service provided by subcontractors, and focused on ways to improve the quality of construction affected by subcontracting. A questionnaire survey was conducted to investigate the extent and involvement of construction firms in subcontracting, reasons for subcontracting, and the selection criteria of subcontractors. The survey also sought information on forms and terms of subcontracts, associated problems with remedies, and the overall satisfaction with subcontracting. Additionally, interviews were conducted with researchers, professionals and experts of the industry. The results reveal a widespread use of subcontracting and sub-subcontracting in the construction industry, primarily done to save time and money. The results reveal that the selection of subcontractors is made from a list developed by each company on performance based on the experiences that they had with the subcontractors on previous projects. Results show that substandard quality of work of some subcontractors is the main problem area. Conversely, the use of direct labor was found to be an unprofitable proposition because of the high degree of uncertainty, fluctuations in construction workload and higher administrative overhead costs. Results show that 53% of the respondents are satisfied with their current subcontracting experiences, whereas 47% of the respondents want positive changes to be made in subcontracting arrangements. To rectify flaws in the existing subcontracting system, the following remedies were noted: 1) reduction in number of layers or tiers of subcontracting to effectively manage the communication gap between prime contractor and subcontractor; 2) to establish mandatory subcontractor registration, prequalification and performance evaluation; 3) adopt a standardized form of contract between

contractors and subcontractors, and ; 4) develop the infrastructure for the technical training of subcontractors to improve construction quality. Further insights and discussions are given in the paper. The findings of this research will help subcontractors to improve their performance and assist all stakeholders in the successful execution of a quality project by making judicious employment of subcontracting.

Contents

List of Abbreviations

FBS	Federal Bureau of Statistics
GOP	Government of Pakistan
SAPO	South Asian Productivity Organization
E&M	Electrical and Mechanical
SPSS	Statistical Package for Social Sciences
HVAC	Heating, Ventilation, and Air-Conditioning
ANOVA	Analysis of Variance

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Chapter 1

INTRODUCTION

1.1 General

General contractors rely intemperately upon subcontractors to reduce costs and increase efficiency on construction assignments. Subcontractors are usually specialized contractors to execute specific tasks that principal contractors do not or cannot perform (Markowitz 2007). Hence these tasks are reassigned to lower tiers contractors known as subcontractors. Although, use of subcontracting is wide spread in construction industry of Pakistan, the issues concerning it are badly neglected. In order to explain the many unanswered questions linked to this topic, a survey was conducted and questionnaire was sent to clients, consultants , general contractors and subcontractors that provided information discussed in subsequent chapters pertaining to quality , contractual relations, reasons for its existence and suggestions for improvements.

1.2 An Overview of Construction Subcontracting

Subcontractors furnish an extremely distinguished task on the construction projects. On numerous building projects, it is common for 80% to 90% of the tasks to be performed by subcontractors (Hinze and Tracey 1994). Most prime contractors let part or their entire project due to their inability to perform specialist tasks on construction assignment e.g. plumbing electric and insulation. "Everyday economic facts have confirmed the subcontracting system to be efficient and economical in the use of available resources"(Arditi and Chotibhongs 2005).The prime contractor is not the only entity in construction business who sublets the works but Subcontractors may also let an allotment or their entire win to sub-subcontractor. The nature of the construction business encourages the construct of economic practicability; therefore allowing the use of subcontractors increases work quality and decreases outlay or cost. Eventually prime contractors and subcontractors are both contractually responsible for the parties to which they

award subcontract. Previously sub-subcontracting was not practiced as extensively as it is today. Thirty years ago sub-subcontracting was virtually inactive. Today, complicated projects, the shortage of experienced manpower, profit temptation and risk reduction are the reasons for the ascension of sub-sub contracting .With sporadic and unpredictable workloads with the requirement of specialized skills, more principal contractors rely intemperately on subcontracting to restrict their risks (Beardsworth *et al.* 1988). This is especially the housing in Hong Kong, where the normal undeviating experience of direct labor accounts for exclusive around 1% of the gross assure sum (Lai 1987). Abundant practice of subcontracting is also reported in numerous other countries, including the UK (Flanagan and Gray 1989) and Japan (Kimura 2002). (Richter 1982) argued that prime contractors can obtain a higher vantage slip as for as profit is concerned by minimizing their performance costs by subcontracting assignments. Subcontracting has also given leverage to firms to have minimum possible employees under intense fluctuating demand (Üsdiken *et al.* 1988). Through subcontracting, the risks of prime contractors are also reduced, as errors in estimating or added costs caused by delays or extra workforce requirements can be retained by the subcontractors attached (Loh and Ofori 2000).Despite these benefits, the quality of subcontracting work deteriorate when incapable or naïve subcontractors are engaged. Additional problems also live in the areas of bid shopping, vague accountability, and altissimo fragmentation (Palaneeswaran *et al.* 2002).

Everyday economic analysis has verified the efficiency of the subcontracting practices in the judicious employment of available resources. The resources of the average prime contractor are not extensively high to afford full-time recruitment of skilled work force in each of the several specialized trades needed in the construction, nor is it possible for these companies to own, operate, control, and maintain specialized plant and equipment have limited usage in a project. Another valid reason for subcontracting is that specialized subcontractors are normally able to execute their work specialty more efficiently and at a reduced cost than the main contractor. The subcontractor may sublet some of the work and have a chain of sub-subcontractors. In addition they may have contractual bindings with material

vendors, manufacturers, suppliers, and distributors. . Consequently, the utmost important issue is to identify the significant factors critical to the construction management and organizational success of sub-contractors.

1.3 Objectives

In the Pakistan construction industry subcontracting practices are extensively used in residential, commercial and other civil engineering projects. Even though a major portion of a construction project is usually executed by the subcontractors, the issues regarding subcontracting are seldom acknowledged and addressed. A very little research work has been carried out and very less published information available on the subject. The few research studies conducted on this subject have investigated individual aspects rather than subcontracting in its totality.

The objective of this research was to examine the existing subcontracting practices in the construction industry of Pakistan, identify the major problem areas, and explore the overall satisfaction with the quality of service provided by subcontractors in Pakistan. Ideally, this information would improve the quality of construction provided by subcontractors and help stakeholders to seriously evaluate their ongoing and future projects, with the intent being to improve the subcontracting practices in the construction industry of Pakistan.

1.4 Research Process and Methodology

To carry out the research in a systematic manner and to attain the research objective the methodology adopted consist of four stages i.e. 1st stage: through literature review identification of research topic, fixing of objectives and scope and furnishing outline, 2nd stage: collection and recording of data through survey and other sources, 3rd stage: research analysis and interpretation and 4th stage: conclusions recommendations and writing. The diagrammatic illustration is shown in figure 1.1.The detailed research methodology is discussed in chapter 5.

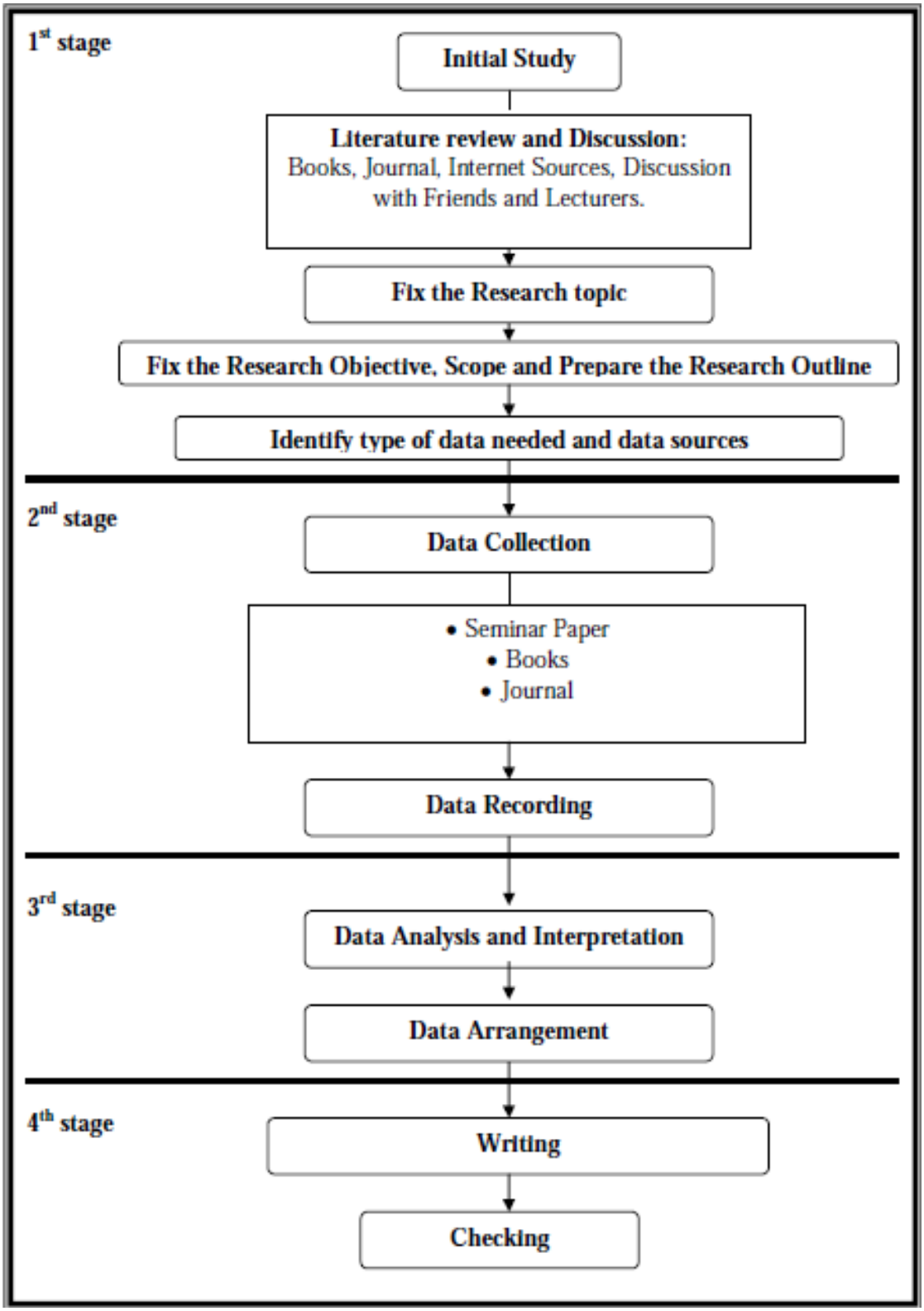

Figure 1.1: Research Process and Methods of approach

1.5 Scope and Limitation of Research

There is no specific study and related books on subcontracting in construction industry of Pakistan. The information was generally acquired from the seminar papers, journals and discussion with the experts and questionnaire survey conducted for the purpose of study.

1.6 Overview of Dissertation

Chapter 2 briefly presents literature reviews on the subcontracting, important definitions, types of subcontracting, reasons for subcontracting, and its advantages and disadvantages.

Chapter3 examines the use of direct workforce as an alternate to subcontracting.

Chapter 4 discusses impact of subcontracting on construction quality management.

Chapter5 describes the methodology used in this research. Questionnaire survey and interviews are the major methodologies used in the study. It also discusses details of the survey on the subcontracting practices, purpose of the survey, survey structure, sample and analysis techniques used.

Chapter 6 describes the construction industry of Pakistan, modules of the local contractors and subcontractors, size of their firms and their representation in Pakistan construction industry. Results of survey conducted have also been discussed in the same chapter.

Chapter 7 will draw conclusions about all the findings of the previous chapter and gives specific recommendations in respect of subcontracting and the management of quality in construction. This chapter also states the suggestions for future research.

1.7 Summary

This chapter gave an introduction of construction subcontracting, and listed objectives of research. The theoretical base for this study comes from an extensive literature review (see Chapter 2).Chapter also briefly highlighted the methodology

adopted for this research as well as its scope and limitations. Furthermore, this chapter provided overview of this dissertation.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

Sub-contracting is extensively used in the construction, however little has been written on the subject particularly in the context of Pakistan. Due to lack of prior studies about subcontracting, this research reviews the major issues involving subcontractors that have been explored in the literature. This chapter provides a grounding to understand the dynamics of the subcontracting. Subcontracting has always been pivotal in the construction business, distinctly in building construction where the construction process is fragmented into a numerous discrete activities (Yin 2006). These activities require sequential execution and may also necessitate specialists for their completion. This chapter will be looking into various aspects of subcontracting pertaining to construction industry significantly definitions, types, classifications, and rationales of its existence highlighted in the previous studies.

2.2 Definitions of Subcontracting

Westwood and Cremer defined that "Subcontracting is another form of external linkage which has been viewed as increased interest in the context of both developed and less developed economies and with respect to both domestic and international subcontracting (ISC)".(Arena *et al.* 1992)

UNIDO 1974 defined "subcontracting" as the "relationship that exists when a firm (the principal) places an order with another firm (the subcontractor) for the manufacturing of parts, components, sub-assemblies or assemblies to be incorporated into a product which the principal will sell. Such orders may include the treatment, processing or finishing of materials or parts by the subcontractor at the principal's request".

Neo 2010 defined "subcontracting" as "a transaction in which one enterprise (the principal) confers on another (the subcontractor) the task of carrying out on its behalf and according to pre-determined specifications some of the production activities for which it maintains final economic responsibility".

In a slightly altered manner, Asian Productivity Organization defined "subcontracting" as a "business practice whereby the party offering the subcontract (parent firm or company) requests another independent enterprise (subcontractor) to undertake the whole or part of an order it has received instead of doing the work itself, while assuming full responsibility for the work as well as the customer"(SAPO 1978).

Although above definitions were substantiating the manufacturing industry, these could be used with slight modifications to expound the nature of subcontracting in the construction business.

2.3 Types of Subcontractors

Concerning the types of subcontractors,(Lai 1987) has enumerated following seven types of subcontractors:

- Separate contractors or suppliers employed direct by the client
- Nominated subcontractors
- Nominated suppliers
- Domestic subcontractors
- Domestic suppliers
- Direct labor of main contractors
- Utility companies

2.3.1 Separate contractors or suppliers employed directly by the client

These separate contractors or suppliers can be straightaway hired by the client to carryout work or cater tangible to the construction site in addition to the principal contractor's bid acquisition. In this system, the separate contractors or suppliers get into contracts directly with the client and do not move into any

contractual relationship with the prime contractor. The risks for any non-performance or non-observance of the abstracted contracts thus put totally with the client and the principal contractor`s duties are purely to provide access to the site and the provision of facilities and services mentioned in the contract document.

Due to Shifting of risk to the client, this system is not common in private sector of Pakistan's construction industry. Mostly Works carried out by separate contractors in private sectors are highly specialized technical jobs such as electrical and mechanical works, because the clients can exercise complete control over the progression and accuracy of the complex assignment. This is especially preferred by clients in series of similar works as they can employ the synoptic set of contractors to achieve uniformity and consistency in the craftsmanship.

The case is different as for as public sector is concerned. Contracts which are undertaken by the Government or public sector, all the E & M works in entirety are executed by separate contractors. These E & M works comprised air-conditioning, escalators, onset fire services etc. As per the government officials, the rationale behind the shift of E & M contracts from nominated to separate contractors is that this placement reduce the risk of the subcontractors of getting late payments from the principal contractors .Furthermore It would not only minimize the disruption of specialized works due to any such delay in payment but would also reduce tender price by relieving the subcontractors from cash flow complications (Lai 1987).

2.3.2 Nominated subcontractors

Another type of subcontracting described by (Dossick and Schunk 2007), in which main contractor has no choice whether to subcontract and little choice about to whom to subcontract, as the architect’s nomination will mostly have to be accepted. Usually, the nomination is mentioned in the tender document by a prime cost sum, so are named as nominated sub contractors.

As per (Debrah and Ofori 1997) a nominated subcontract allows the complete involution of client or his professional team in the early selection of the individual company, using the subcontractor’s expertise for design and

coordination. Nomination is the process by which an employer through respective contract administrator, choose a subcontractor who then gets into sub-contracts with the prime contractor (Tserng and Lin 2002). Hence nominated subcontractors are nominated by the employer or his professional representatives and he gets into standard form of contract with the principal contractor. The principal contractor may object to such nominations because he remains contractually liable to the employer for the nominated subcontract work. Objections against such nominations are also very common in Pakistan construction industry due to poor performance of nominated subcontractors on various accounts .Mostly nominated subcontractors are awarded specialist electrical and mechanical works and specialist installation contracts.

2.3.3 Nominated suppliers

Nominated Suppliers are essentially nominated by the employer to formally get into supply contracts with the prime contractor. The extent of their work includes the supply of materials and goods delivery to the work site or other designated warehouses, Nominated suppliers do not execute construction work on the site. Their selection process is similar to the nominated subcontractors.

2.3.4 Domestic subcontractors

Lai 1987 regarded that prime contractors are apparently free to select domestic subcontractors unlike nominated subcontractors who are selected by the employer. (Beardsworth *et al.* 1988) assert that a domestic subcontractor is one in whose selection the client usually plays no significant role, other than simply giving consent where it is required under the specified terms of the principal contract.

Lai 1987 has categorized the domestic subcontractors into further two types on the basis of their selection criteria .Over the selection of first type of domestic subcontractor contractor has absolute freedom of choice, whereas in second type, contractor has an obligation to choose the domestic subcontractor from the

“approved list of subcontractors” furnished by the employer. The domestic subcontractors after selection will get into contract with the prime contractor. However, there is no standard commonly adopted form of contract between contractor and domestic subcontractor within the construction industry in Pakistan .In domestic subcontracting system to ensure a minimum standard employers adopt an instrumentation by providing lists of approved domestic subcontractors and suppliers in the tender documents instead giving contractor a free choice. By doing so, the employer will be able to maintain his supremacy in the process of subcontractor`s selection as well as his check on the quality.

Traditionally, types of works usually fall in the sphere of the domestic building contracts are masonry, plastering, bricklaying , steel bending and fixing, concrete work, formwork joinery, scaffolding, carpentry and joinery, roofing and waterproofing, tiling, drain lying , plumbing , floor laying, window installation, painting, and , glazing etc.

2.3.5 Domestic suppliers

Domestic suppliers are selected by main contractor without any interference by the client .However in some cases this freedom of choice is limited to the approved list of subcontractors given by the client in the main tender documents. In this way client will not only maintain his influence on work progression but at the same time contractual responsibility of supplier will remain with the prime contractor. The supply items provided by the domestic supplier include building materials such as cement, steel, bricks, lime, etc.

2.3.6 Main contractor's direct labor

As the name indicates direct labor is other than the labor provided by the domestic and nominated subcontractors, it is directly recruited by the main contractor and are on his payroll. They are entitled and benefitted as permanent employees of the main contractors. On almost every project they form a very small portion of the total work force.

Main contractor`s direct labor is utilized to execute supporting nature jobs to other trades which are best performed under central control e.g. fitters, levelers, hoist operators, transport drivers, and mostly a team of unskilled workers to execute those tasks which cannot clearly be distributed among various subcontractors such as debris removal and general cleaning etc.

2.3.7 Utility Companies

Utility Companies are induced on the site to perform the jobs relevant to the public utility supplies. Their work substance is generally small comparing to the overall quantum of project, and they are mostly employed as separate subcontractors, or the nominated ones. They have their own standard terms of contract, and the employer or the prime contractor will get into a contract with these companies adhering these standard conditions.

Although apparently there are various choices available with the employer and the prime contractor for their work arrangement with each of the option having its own pros and cons. Traditionally, the construction operation is taken on by two main groups which consists of contractors and consultants where both acting on behalf of their employer. Additionally subcontractors and suppliers are there to help out contractor. The contractual and procedural relationship of various parties involved are illustrated in Figure 2.1

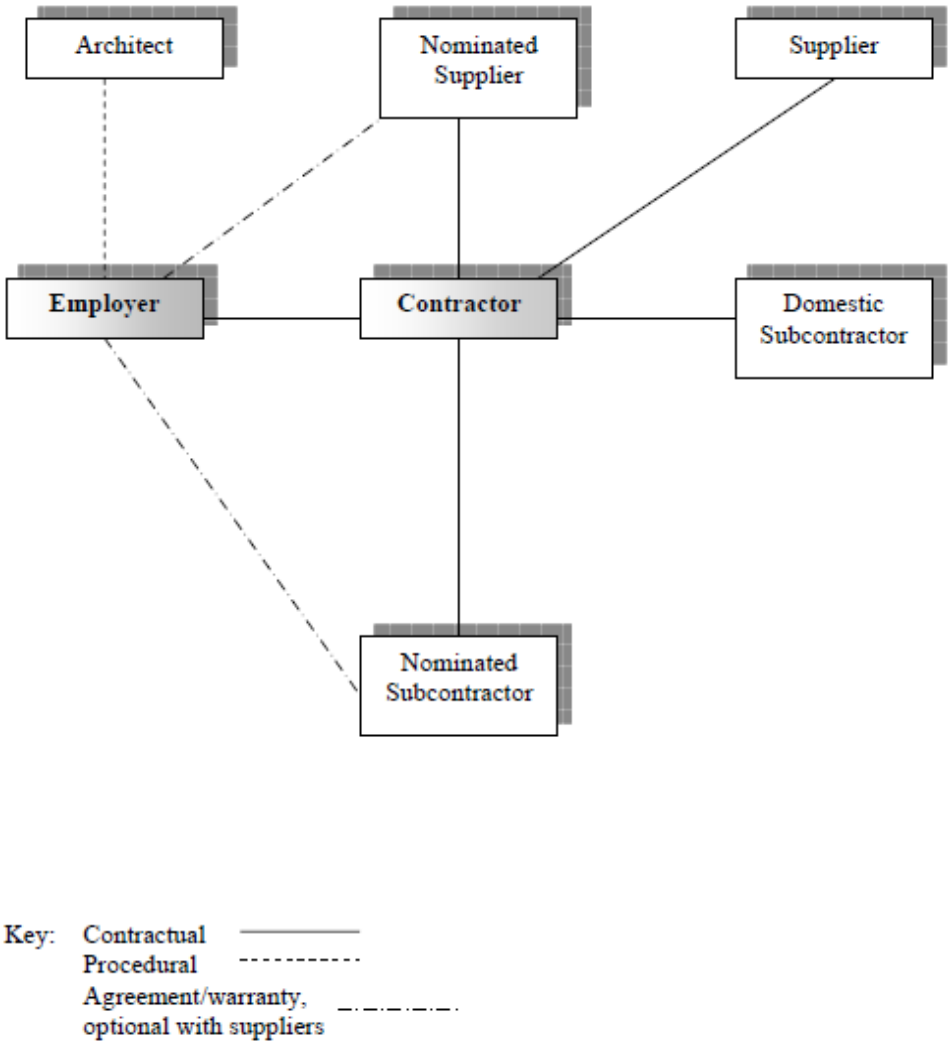

Figure 2.1: Contractual relationships of the parties (S.Collin 1989)

2.4 Classification of Subcontractors in Building Construction

Specialist agents who execute a specific job such as provision of manpower, supply of material, tools, equipment or design are subcontractors (Costantino and Pietroforte 2002). They respond only for the executed part of the workmanship, acting as agents of the production system of the contractor company *Ibid*.

On the basis of activities performed subcontractors have been divided into numerous classifications. Table 2.1 displays three classifications of subcontractors organized by Brazilian authors in the sphere of building construction. The table was adapted from(Farah 1993), (Villacreses 1994) and (Pereira 2001).

Table 2.1: Classification of Subcontractors

Author	Classification	Examples Activities
Farah (1993)	Subcontractor of basic activity	Formwork, mortar, concrete, masonry, rendering and ceramic coatings.
	Subcontractors of stages and specialised jobs	Jobs done by workers with specific qualifications.
Villacreses (1994)	Subcontractors of basic	Formwork, mortar, concrete, masonry, rendering and ceramic coatings.
	Subcontractors of special techniques	Electric fittings, plumbing and air conditioning.
	Subcontractors of special work and/or materials	External waterproofing, painting, floor, glasses, external rendering and foundations.
Pereira (2001)	Subcontractors supplying manpower	Masonry and painting.
	Subcontractors supplying manpower and materials	Electric fittings, plumbing and joinery
	Subcontractors supplying manpower, materials and design	Waterproofing and gypsum wallboard.
	Subcontractors supplying manpower, materials design and maintenance	Air conditioning, sprinkler system and special fittings.

2.5 Layers of Subcontracting

Referring to definitions and three classifications of subcontracting there simply exist a one-to-one affinity and relationship between a prime contractor and a subcontractor, a chain of such relationships also co-exist at the same time, which results in a hierarchy or pyramid of principal, subcontractor(s), sub subcontractor (s), and so on.

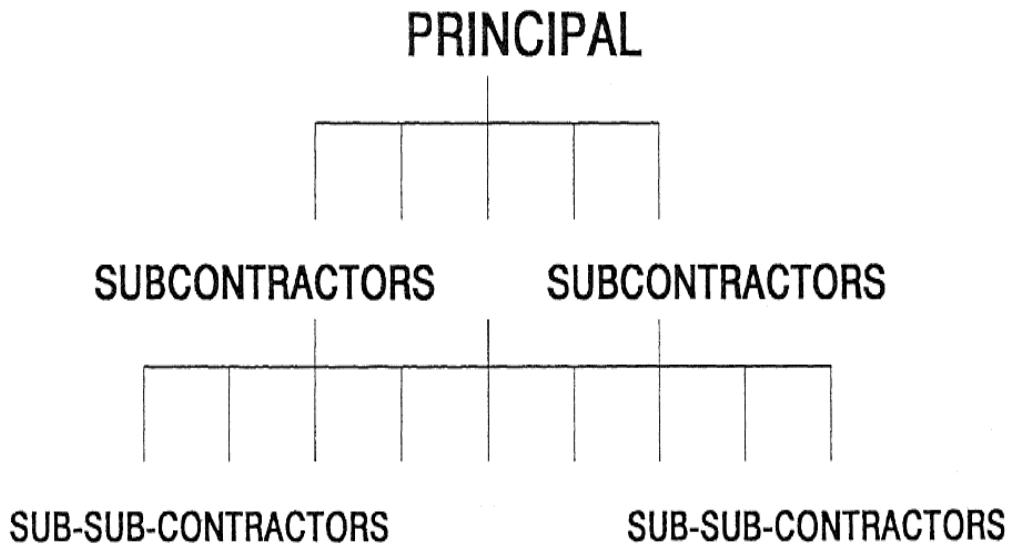

Figure 2.2: layers of subcontracting (S.Collin 1989)

This does not only give rise to different layers or levels of subcontracting but also emphasizes on the need of horizontal coordination at the same level in addition to the vertical coordination at different levels.

(Beardsworth, *et al.* 1988) explained the hierarchical stratified composition of subcontracting in Japanese industry using the following nomenclature:

- Parent Firm
- Primary Subcontractor
- Secondary Subcontractor
- Tertiary Subcontractor
- Quaternary Subcontractor

(Costantino and Pietroforte 2002) named to the above phenomenon as a "pyramid" of subcontractors. They observed that in the Japanese industry in 1979, a huge majority (over 88%) of the secondary and the tertiary subcontractors were small and medium firms.

(Richter 1982)) also ascertained that in Japan small and medium sized subcontracting enterprises had dual production and intensifier to Japanese productivity. The subcontracting arrangement is usually represented as the contractual phenomenon in which a prime contractor subcontracts portion of the work to another contractor, who may also sublet to some other enterprise or further subcontract(Chiang 2009).This multi-layer supply chain arrangement can graphically be presented in Fig.2.3

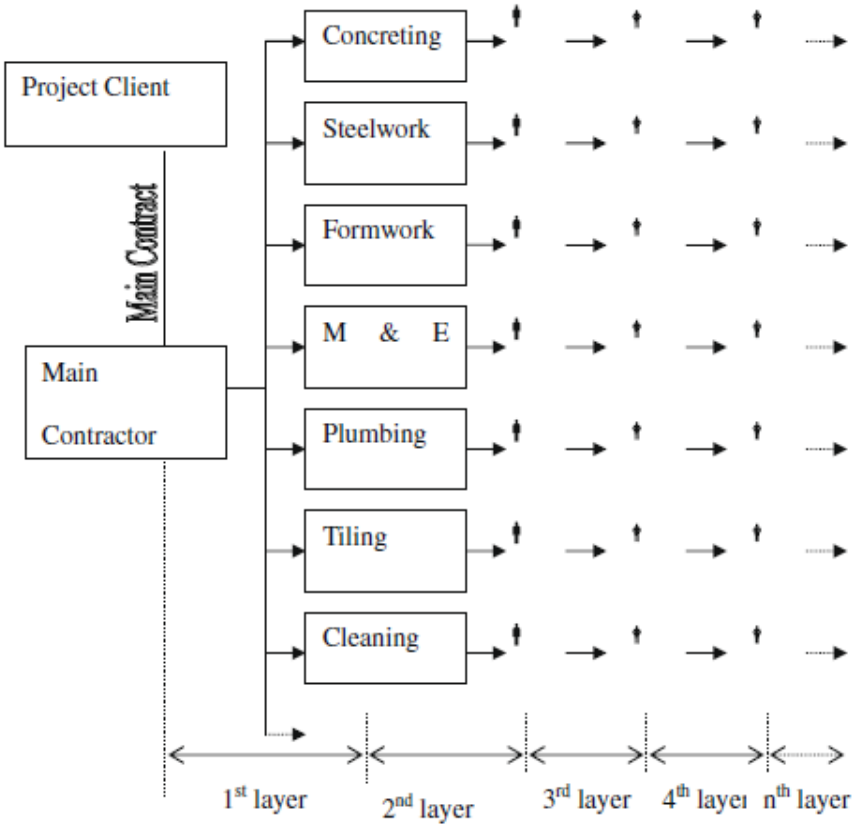

Figure 2.3: Multi layered subcontracting (Tam *et al.* 2010)

2.6 Rationale for Subcontracting

This section expresses the various reasons of subcontracting as a result of research studies carried out by various researchers. It is also recognized by (Uher 1991) that different enterprises subcontract for variety of reasons at different point in time.Kimura 2002 spotlighted four major reasons of subcontracting i.e.: to reduce cost, to reduce risk, to increase flexibility, and presence of favorable government policies at places.(Chan *et al.* 2006) featured specialization, concentration, previous relations with subcontractors, flexibility, low cost, efficiency, high quality, and need for small infrastructure as the glaring reasons of subcontracting in Japanese industry.

(Reeves 2002) as a result of survey in Singapore in 1985 highlighted the reasons of subcontracting in order of priority are work beyond capacity, to save upon cost ,government policies and guidance, and maintain cheaper and stable work-force with minimum overheads to save excessive investment on equipment and plant.(Tserng and Lin 2002) in their study on small and medium enterprises accorded reasons for subcontracting in Hong Kong such as insufficient capacity, labor shortage cost reduction, specialization and business cycle.

Above all surveys were conducted on manufacturing industry overall not purely on construction industry. In 1991 (Standish and Krafchik 1991) conducted a survey on Hong Kong construction industry and he reported following reasons for subcontracting in construction industry of Hong Kong in the perspective of contractors and subcontractors tabulated in table 2.2 along with responses received:

Table 2.2: Reasons for Subcontracting

Main Contractors' Reasons for Subcontracting	Yes	No
Follow the tradition	21	12
Unable to undertake work	30	3
Outside capacity	25	5
To reduce costs	31	2
To reduce risks	30	3
To save time	28	4
To absorb fluctuations	29	4
To maintain relationship with subcontractor	29	3
Tax advantage or tax evasion	18	14
Subcontractors' Reasons for Subcontracting	**Yes**	**No**
To increase profits	16	2
To reduce losses	12	5
To increase volume	17	1
To maintain relationship with main contractor	17	1

(Markowitz 2007) conducted a survey on construction industry in united states of America and identified following reasons of subcontracting along with graphical representation in figure 2.4.

Work was too specialized for ordinary work force (61% favored it)

Inability to render sufficient work force to execute work(26% were for it)

Fixed price subcontracting (13% agreed that work was subcontracted at fixed price)

Any other reason for subcontracting (insignificant)

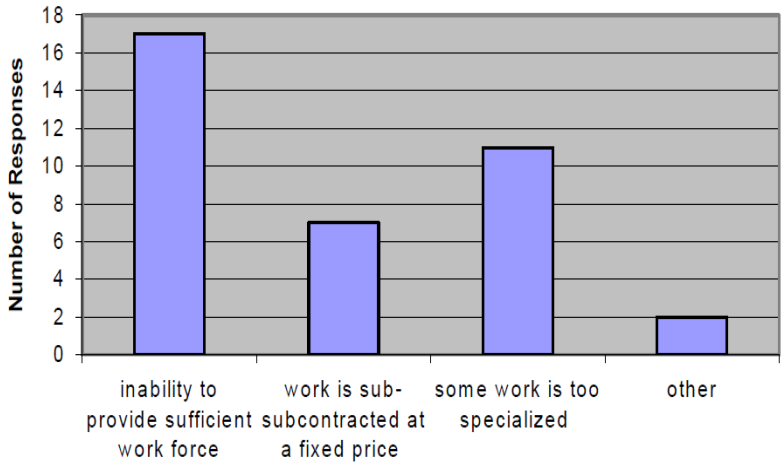

Figure 2.4: Reasons of subcontracting work by (Markowitz 2007)

2.7 Advantages of Subcontracting

South Asian Productivity Organization(SAPO 1978) asserted that "under the system of subcontracting, a vertical relationship is formed between two parties which develop a complimentary, not necessarily supplementary, linkage in economic development. Under the umbrella of the parent firms that provide necessary assistance relating to technology, marketing and management, the subcontracting firms in return make a dent in the production plan where parent firms may find it uneconomical to deal directly with the whole spectrum of production."

South Asian Productivity Organization(SAPO 1978) based on the survey conducted in Hong Kong in 1976 found the merits of subcontracting shown in table 2.3 below:

Table 2.3: Merits of Subcontracting

Merits of Subcontracting	
Merits for Parent Firms	**Merits for Subcontractors**
1. Saving in labor cost	1. Marketing advantage
2. Saving in material cost	a. Guaranteed market
	b. Access to business connections of parent firms
	c. Reliability on parent firms marketing efforts
3. Diversification of product range to buffer against business fluctuations	2. Access to technology and skills
4. To concentrate production on higher quality products	3. Supply of machinery and equipment
	4. Access to raw materials
	5. Access to improved management skills

Likewise, (Tserng and Lin 2002) indicated the reciprocative merits of subcontracted deliverables for both principal firms and subcontractors. He identified the long-term bondage between principal firms and subcontractors as "production partners bound by common fate".(Costantino et al. 2001), emphasized the benefit of the subcontracting in Japan in "providing a rational and efficient division of labor, with benefits expected on both sides". (Chan, et al. 2006) highlighted that "an important advantage is in the subcontracting system's ability to react quickly to meet the market needs pursuing mass diversification".

Undoubtedly one of the most significant benefits of subcontracting to the parent firms is its high degree of and elasticity and flexibility. (Gadde and Dubois 2010) has mentioned Job Creation and technology transfer from prime to subcontractor and vice versa as glaring advantages of subcontracting. (Yik and Lai 2008) has stated the advantages of international subcontracting as:

- Mechanization and instrumentation in developing industries.
- Decentralized and standardize production on a world-wide scale.

- International cooperation between countries.\

2.8 Grey Areas of Subcontracting

Despite having numerous benefits discussed in the previous section subcontracting does have few grey areas. South Asian Productivity Organization(SAPO 1978) tabulated below in table 2.4 glaring problems of subcontracting in Japan:

Table 2.4: Problems Faced by Parent Firm

Problem Areas	No. of Firms
Quality control	24
Low technical standards	21
Communication problems	12
Delivery	10
High costs or inefficiency	9
Inadequate supply of raw materials	6
Financial problem	6

(Chang 2006) stated the problems as a result of subcontracting with small enterprises in table 2.5:

Table 2.5: Difficulties in Dealing with Subcontracting

Difficulties In Dealing With Small Subcontracting Firms	No, Of Firms
Quality	32
Delivery	28
Shortage of subcontracting firms	20
Price	10
Unstable management of firms	8

(Sit and Wong 1992) also identified the problem areas of subcontracting in table 2.6 below:

Table 2.6: Problems in Subcontracting

Types of Problems in Subcontracting	% Of Local Firms Interviewed that Had Such Problems
Failure to meet delivery	43
Low quality	23
Unstable management	14
Shortage of adequate firms	7
Shortage of quantity	5
Others	0

(Watanbe 1971) identified poor quality and delay in completion as the most significant problems of subcontracting. He also adds that .Exploitation by parent firms and sub-contractors role as a buffer to principal firm by absorbing in seasonal sudden fluctuation is also exposed to losses.(Sit and Wong 1992) also stated, that the arrangement of subcontracting in Hong Kong (attributed by the term "mechanical market-response") function against developmental actions. The root cause of the problem pointed out by them is interim and unstable relations between subcontractor and prime contractor which is the main hazard in the outgrowth of technical managerial and economic development in Hong Kong.

2.9 Summary

This chapter concisely described aspects of subcontracting from literature review on the subject through numerous sources. Almost all of the construction assignments will heavily rely on subcontracting. Several ways to assign the task to the subcontractors have also been discussed in the chapter. The phenomenon of differentiation of right and obligation and accomplishment of work can be done through subcontracting either nominated or domestic. The parties involved commonly are the employer, main contractor, nominated subcontractor and domestic subcontractor. All of them have been bound in a contractual and procedural relationship. A nominated subcontractor plays significant role in construction assignments require highly specialized skills. Advantages and benefits of manufacturing subcontracting have also been discussed in the chapter2,

apparently outcomes might not be fully applicable to the construction industry. Nevertheless, as succeeding chapters will manifest, many of the pros and cons referred in this chapter also emerge in case of construction industry of Pakistan.

Chapter3

ALTERNATIVES TO SUBCONTRACTING

3.1 Introduction

Chapter2 have elaborately covered the reasoning, advantages and grey areas of subcontracting. In this chapter the effort has been made through extensive literature review to ascertain that whether direct labor is an alternative to subcontracting as being more effectual system. Relative comparison of both the practices would let us establish the ideal practice for the construction industry.

3.2 Academic Orientation of subcontracting and direct labor

(Wang and Liu 2005) presented the academic orientation of transaction cost and organizational failure approach. In subcontracting, organization of the labor force is mediated principally through the subcontractors "market", whereas in case of direct labor the management of the labor force is exercised through an "internal organizational hierarchy".

(Williamsons 1975) described "transaction" as the fundamental component for fiscal and organizational analyses. Under such circumstances, (Williamsons 1975) stated that the internal organization has edge over the market because:

- The firm substitutes a single incomplete contract (e.g. an employment contract) for many incomplete ones.
- The firm removes the tribulations and problems owing to bounded rationality and vagueness and uncertainty. This is done through the enterprise chronological decision mechanism, efficient communication, and internal conflict resolution mechanisms.

(Williamsons 1975) work was further elaborated by (Standish and Krafchik 1991). They described that transaction costs are a resolution to the difficulty of collaboration in the

dominion of financial activity. For market management to work proficiently, it is essential that the information for decision making might be entirely portrayed in the prices.

3.3 Transaction Costs in Construction Industry

In any construction venture, the cumulative cost is:

Cumulative cost = Production Costs + Transaction Costs

Although the transaction cost is non productive but is imperative to attain the objectives of the project. The cost of prime contractor of negotiating, selecting, helping, supervising, managing and contracting constitute the transaction cost.Following (Williamsons 1975), the issue is whether an alternative to subcontracting i.e. direct labor could economize the transaction costs. The amount of transaction cost basically depends upon the associations between the prime contractor and subcontractors. These relations are difficult to grow due to increase fluctuation in the work load which basically hinders the upholding of the long term relations. Mostly the relations between contractor and subcontractor are momentary. Mutually contractors and subcontractor just outline a "collective task set" (Reeves 2002). As soon as the project completes, the task set is practically dismantled. (Wang and Liu 2005) stated that the construction assignments could best be considered as a alliance. The parties are more affiliated with their organization than with the construction project, which give rise to coalition. Majority of the enterprises want to boost their profit margin. The construction industry is highly associated with inherent uncertainty and risk. (Wang and Liu 2005) explained the following main sources of uncertainties with regards to construction:

- Task Uncertainty is associated with the construction task being undertaken. Problems linked with a construction task are exclusive and unique to that specific construction assignment.
- Natural Uncertainty refers to force majeure or unpredictable weather and hazardous environment to which a construction project is exposed.
- Organizational Uncertainty is linked with the new organization made for any new construction project in which the people are not well known to each other and do not have any prior functional relationship with each other.

- Contracting Uncertainty is associated with the common competitive tendering contracting system which makes it more uncertain that which contractor and subcontractor would undertake the construction project.

Construction projects are associated with higher degree of abstraction because of the involvement of various parties and trades. All the elements involved in construction business have a strong dependence upon each other.(Williamsons 1975) analyzed, that inclination towards "internal organization" could be advantageous, and could facilitate the prime contractor to save on transaction outlay and can exert more effective control over the administration of construction project. (Devapriya and Ganesan 2002) observed that direct labor was initially used in 1890 by construction icons in the U.K. construction industry to improve work quality, enhance control of project and to check the contractor's corruption.

3.4 Use of Direct Labor - Unprofitable Proposition

According to (Williamsons 1975) the use of direct labor will be highly unprofitable for the prime contractor due to increase transaction cost. (Flanagan and Gray 1989) also observed that the subcontracting in construction is spreading extensively. Mentioned the remarks of one of the respondents of his questionnaire survey, he stated that "direct labor system is the solution but it is a burden to a construction company in a highly competitive environment without a guarantee of continuity of work". also commented that his response highlighted the practical complications that prime contractor faces as regards to subcontracting. Despite the benefits of direct labor and the shortcomings of the subcontracting arrangements, the considerable workload fluctuations in construction business make subcontracting the only practicable solution. Direct labor has only limited application(Cheng *et al.* 2011). He also stated that "main contractors really had no choice but were really pushed into subcontracting"(Cheng, *et al.* 2011).(Dossick and Schunk 2007) described that due to inbuilt risk and insecurity in construction industry the subcontracting (rather than direct labor) offers a lesser cost for organizing construction project.

3.5 Summary

The widespread use of subcontracting has verified its dominance on use of direct labor. Most of the researches have disregarded the use of direct labor in

construction industry and declared subcontracting as the alternative of direct labor. Subcontracting is not absolutely flawless alternative, there is a need to perk up and improve its adverse effects on quality of construction work**.**

CHAPTER 4

SUBCONTRACTING AND QUALITY ISSUE

4.1 Dimensions of Quality

Several thinkers have given different meaning to word "Quality". For example, "Quality" has been stated as tantamount to "Fitness for Purpose"(Yamawaki 2002). "Doing things right first time, every time""Value for Money"; "Conformance to Requirements" (Wang and Liu 2005). Each of these definitions highlights or stresses a specific feature or ingredient of "Quality".

Douglas Hogg, U.K. Minister for Industry and Enterprise, said that "quality means giving complete satisfaction - providing customers with exactly what they want, when they want it, at a price they can afford".

The renowned International Standard ISO: 8402 defines "Quality" as "The totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs". And "Quality Management" as "That aspect of the overall management function that determines and implements the quality policy".

(Yamawaki 2002) stated that "quality has multiple dimensions. Quality is at the same time "product performance - product satisfaction" and "freedom from deficiencies - no product dissatisfaction". (Wang and Liu 2005) of the Harvard Business School projected Performance, Features, Reliability, Conformance, Durability, Serviceability, Aesthetics, and Perceived Quality as eight dimension of quality.(Standish and Krafchik 1991) distinguished that above mentioned dimensions are while some of the above eight dimensions of quality are commonly reinforcing. (Debrah and Ofori 2001) supplemented the Garvin's work to incorporate the subsequent additional dimensions of quality such as quick response, quick change expertise, value, humanity.

To conclude, quality can be measured along diverse dimensions customer’s desires and expectations must also be considered in assessing the quality of any service or work.

4.2 Quality Control and Quality Assurance

It is important to know about these two aspects of quality before discussing the management of quality.

- *Quality control* is basically a check of final product prior to its release to client or consumer; it is the identification and eradication of mistakes after their occurrence.
- *Quality assurance*, on the other hand, is maintenance of quality at each stage of execution through entire production process. It is a preventing strategy rather than curing. QA dictates process steadfastness. It is superior to QC.

4.3 Significance of Quality Management

Regardless of the multiplicity of thoughts over the definitions of quality, nearly everyone is of the same opinion that quality is imperative and required to be managed. Standish and Krafchik 1991) declared it as "strategic competitive weapon". In his view, quality is "pleasing (delighting) the customers, and not just protecting them from annoyance". Earlier, (Francis and Hoban 2002) argued that "quality is free". Execution of task in a sub standard way initially, will cost subsequently. Whereas quality work at first instance will be free of subsequent cost. In U.K., a white paper by the Trade and Industry department with title "Standards, Quality and International Competitiveness" (D.T.I. 1982) described that "Quality Assurance in the shape of sound technological and managerial procedures for ensuring quality, offer more extent for dropping costs and enhancing competitiveness and profitability than many other management controls". The paper further stated that "Success in the global markets increasingly depend on a supplier's capability to satisfy clients on non-price factors as well as price". In the U.S.A., the PIMS (Profit Impact of Market Strategy) statistics depicted a strapping connection between comparative quality and production success (Forde *et al.* 2008). The significance of quality management is explained by numerous others. It is commonly alleged that quality management would direct to various substantial and insubstantial reward. The anticipated advantages of quality management incorporate time and cost Savings, and Higher output through lessening of depletion, re-works and discards. In other words, investment in quality is anticipated to save much more in the medium to long term. Due to inherent problems of construction industry the major factors which hinder the quality

management in construction constitute, workload fluctuations, uniqueness of every construction project, inclination towards more profitability and extensive subcontracting. The impact of subcontracting on quality management is one of the, focus of this study and will be elaborated in the impending sections of this chapter.

4.4 Adverse Effects of Subcontracting on Quality Management

4.4.1 Profit amalgamation

(Francis and Hoban 2002) stated that "profit is the test of business validity". A business, regardless of the economic or legal arrangements of society, must produce enough profit to cover the risks of committing today's economic resources to the uncertainties of the future; to produce the capital for the jobs of tomorrow; and to pay for the non economic needs and satisfactions of society". A huge part of money paid by the client for construction project is mostly absorbed by the subcontractor (Lai 1987) so higher the numeral of subcontractor more the money will be absorbed. Lesser money will be actually left behind for construction. The composite consequence of this will affect the work quality because the lowest tier subcontractor who is actually executing the job have limited or no flexibility at all as for as finances are concerned. Consequently he resorts to low quality work to save on the profit. He may compromise on quantity and quality of material, labor and standard work practices. He adopts a tactics of "Don't get caught" rather than " Doing it right according to specification(Wing and John 1991).

4.4.2 Communication gap

Second impact of subcontracting which adversely affect the quality of work is longer chain of command in subcontracting, which increases a communication gap between executing subcontractor and client, and ultimately leads to poor control of client on the construction work. Resultantly project quality suffers. (Giritli *et al.* 1990) emphasized that "the process of maintaining control involves both communication for goal-setting and a means for gaining cooperation from individuals".

4.4.3 Inadequacy of skill and training

The next unconstructive effect of prevalent subcontracting is that only a few subcontractors are committed to training of their human resources. Prime contractors,

although relatively well established, behave more as "traders" on the construction assignments, and merely utilize a lean core of employees so as to reduce their overheads. Subcontractors are mostly smaller enterprises and generally work for numerous clients and do not have time and alluring incentive for a meticulous training and development plan for their workers. Resultantly there is a substantial dearth of trained labor with a declining average level of skill, which affects quality.

In addition to the above main consequences of subcontracting there are also other numerous effects of subcontracting which deteriorate work quality such as *ineffective prequalification criteria of subcontractor* which only exist in case of main contractor, *exploitation of subcontractor* by "Pay when Paid "and others unfair terms of contract. Furthermore subcontractor is *more prone to risk* and bankruptcy due to smaller enterprise and mostly resort to *gamble tendering* without adequate project information subsequently *short fall of finances* affect the quality and progress of work. In exceptional circumstances Subcontractors might also be compelled to *absorb delays* caused by others and to accomplish the task in an unrealistically short time frame. Which ultimately jeopardize the quality. It is also worth mentioning and depressing that quality of work life in the Pakistan construction industry is unsatisfactory. This in turn is an impediment towards improving construction quality.

4.5 Summary

This chapter puts together the dimensions and significance of quality management, moreover it also examines the adverse effects of subcontracting on quality. Above discussion provide an insight of `increasing recognition of the importance of quality management globally with a general idea pertains to approaches presently adopted by employer and contractors in response to the challenges confronted.

CHAPTER 5

RESEARCH METHODOLOGY

5.1 Introduction

In this chapter, the research methodology adopted for this study will be discussed and presented. The main methods for collecting and generating research data are the questionnaire survey and the interview. These data are used to analyze subcontracting practices in Pakistan and suggest measures to improve existing subcontracting practices in selected expert's perception. The following sections provide the details of the research method employed in this thesis. This research was conducted as an exploratory study. It was decided that the information would be obtained through mailed questionnaires and personal interviews, which would yield detailed information. A detailed literature review was carried out and a number of questionnaires (developed by other researchers) were examined. Keeping in mind the construction industry of Pakistan, a survey instrument was finalized based on the research of Sit and Wong (1989) and John (1991). The questionnaire was further modified to make it suitable for the construction industry. A five-point scale with one being „extremely important/most common response "and five being „not important/least common response" was utilized to solicit the perceptions on the degree of importance of various practices. The sample for this research was selected from population ofconstruction enterprises in the industry. The targeted sample groups included personnel from clients, consultants, and contractors/subcontractors which represent the interests of those enforcing policies, commissioning subcontracts, and executing the subcontracted work on site, respectively. The questionnaire was sent to top registered firms with the Pakistan Engineering Council (PEC) including clients, consultants and contractors. Out of the 130 questionnaires sent out, 69 were returned for final analysis. These included responses from 17 clients, 19 consultants and 33contractors/subcontractors group. This represented a response rate of 56.7%, 63.3% and 47.1% for the respective

groups. Table 1 shows an overall response rate of 53%. According to Owen and Jones (1994),a response rate of 20% is considered satisfactory. In construction, a good response rate is around 30%(Black et al. 2000), therefore, the response rate in this research is considered acceptable. Respondents were amply qualified and experienced in the construction industry. Approximately 55% of the respondents had accumulated over 10 years of construction experience, while 45% had 5 to 10years of construction-related experience. The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS-18) through frequency analysis, relative importance by mean scores and one-way ANOVA Kruskal-Wallis tests. A 5% level (or less) of significance was considered to represent statistically significant relationships in the data.

5.2 Research Design

The research objectives have been established in the first chapter. The methods for achieving these objectives will be addressed by designing the research in an appropriate manner. The research methods used in social sciences are, experiments, surveys, archival analysis, case studies, and histories .Moreover method adopted for a particular research depends on the degree of research, type of the research operation (what, how, why) etc, the research focus, and control over variables (Yin 2006). While selecting an appropriate method for research, it is mandatory to consider the links between data collection and its analysis, as well as the main questions to be addressed, and the results. Therefore, when proceeding on a research, the research questions, the data analysis approach and the kind of data, should be considered.

A questionnaire is mostly used as an instrument in social science; and it is used as the main method in this study. For the design of the questionnaire, (Sit and Wong 1992) were referred; instrument was used by them in 1991 during survey of small and medium enterprises in Hong Kong. Except for straightforward "yes/no" answers, use of a discrete 5-point ordinal scale was made, to explore the complete range of possible replies

between "Yes" and "No". This technique also permitted relative comparison of multiple responses to the same question (e.g. reasons for subcontracting).

Other methods, such as interview are likewise chosen to complement and validate the survey questionnaire .Furthermore, the methods used for relevant data analysis in this study are ms excel and SPSS (Statistical Program for Social Sciences) package to have frequency analyses, one way ANOVA and Kruskal-Wallis Test for parametric and non parametric data respectively .The selection of these statistical methods will be introduced in relevant chapters.

5.3 Survey Sample

5.3.1 Sample Selection

The purpose of statistics is to have summary measure about some characteristics of the population through sampling and for good results sampling should be a good representative of population. There are several ways of sampling depending on the attribute of the population. These are judgmental, random, and non-random samplings(Francis and Hoban 2002).In judgmental sampling, selection of sample takes place on the basis of researche judgment, without using statistical sampling techniques. Judgmental sampling is prone to bias, so reason for its use should be clearly mentioned in the study. Random sampling method is used when population structure have no significant variation. Random number table or software programmes are used for the selection of random samples with each of the members having equal chance of selection. Methods used in non random sampling are:

- Systematic sampling
- Stratified sampling
- Cluster sampling.

The sample for this research is selected from a population of construction enterprises in the Pakistan construction industry. According to Pakistan engineering council statistical data, the number of building and civil engineering establishments registered with PEC in Pakistan reached 26000 in 2010. Generally, it is fairly a large population and the sample selection will represent various construction experts including clients, consultants and contractors with different categories and backgrounds. In this research, the judgmental sampling method is used to obtain samples from the population of construction companies in Pakistan. Obviously, surveying all the organizations in the entire construction industry would yield the most representative results though hardly practicable due to amount of work and time involved. The questionnaire was therefore dispatched to 130 randomly selected potential respondents. These included clients, consultants, main contractors and subcontractors. Finally, members of the all Pakistan contractors Association are selected in this study for the following reasons:

- The All Pakistan Contractors Association (APCA) includes major building and civil engineering contractors working in Pakistan, including local and international contractors.

- APCA members can be taken as representatives of construction industry in Pakistan and manufacturing market segments due to their applausive performance.

- As main industry contributors and performers, they intend to exhibit excellence in industry and to facilitate construction development in a wholesome and healthy manner.

The executive appointments of the enterprises were addressed as the research informants, since they are supposed to possess the maximum knowledge regarding the firms existing practices on subcontracting and their pros and cons. The names and particulars of these executives were obtained from PEC and all Pakistan Contractors Association.

5.3.2 Sample Size

According to (Dillman 2007), factors which should be taken into account in determining an appropriate sample size are:

- Sampling error
- Population size
- Variation in answers
- Confidence level

Sample size can be determined using the following formula:

$$Ns = \frac{(Np)(P)(1- P)}{(Np-1)(B/C)^2 + (P)(1-P)} \quad (5\text{-}1)$$

Where:

Ns: sample size for the desired level of precision;

Np: population size;

P: proportion of the population that is expected to choose one of the response categories (yes/no);

B: acceptable sampling error; and

C: Z statistic associated with the confidence level; 1.96 corresponds to the 95% level.

All construction contractors on the Pakistan contractors Association member list are considered and targeted for the survey. Out of the 130 targeted, 69 enterprises returned back the questionnaire valid for the analysis. Table 5.1 showing a

response rate of 53.0% respondents were amply qualified and experienced in the Pakistan construction industry. Around 55% of the respondents had accumulated over 10 years of relevant experience in the industry, and about 45% having 5-10 years construction related experience. Therefore the information provided by these professionals was considered to be authentic and reliable.

Table 5.1: Responses to the Questionnaire

Respondents	No. of Questionnaires Sent	No. of Questionnaires Returned	Response Rate
Clients	30	17	56.7%
Consultants	30	19	63.3%
Contractors/ Subcontractors	70	33	47.1%
Total	13	69	53.0%

There are 69 valid replies out of 130 showing a response rate of 53%. According to Owen and Jones (1994), an average of 20% of questionnaires returned is considered satisfactory. And in the construction enterprises, a good response rate is around 30% (Black *et al.* 2000). Therefore, the response rate in this research is acceptable. The sample size is 69 for the survey, however, to know whether or not this sample sizes can truly represent the population. In formula (3-1), the four parameters can be obtained except for the sampling error. Thus, it is necessary to determine if the sampling error is acceptable. In 2010, there are a total of 26000 building and civil engineering establishments in Pakistan. Since this number can be used as the population size, the 95% confidence level is selected. It is also assumed that the answers will be homogeneous and will set the p value to 0.8. By applying these values in formula (3- 1), the sampling error was obtained as ±9.42%. Overall, this sampling error is considered acceptable for this study. Table 5.2 exhibits

sample sizes required for various population sizes and characteristics at three level of precision.

Table5.2: True sample size (Dillman 2000)

Completed sample sizes needed for various population sizes and characteristics at three levels of precision.

	Sample size for the 95% confidence level					
	±10% Sampling Error		±5% Sampling Error		±3% Sampling Error	
Population Size	50/50 split	80/20 split	50/50 split	80/20 split	50/50 split	80/20 split
100	49	38	80	71	92	87
200	65	47	132	111	169	155
400	78	53	196	153	291	253
600	83	56	234	175	384	320
800	86	57	260	188	458	369
1,000	88	58	278	198	517	406
2,000	92	60	322	219	696	509
4,000	94	61	351	232	843	584
6,000	95	61	361	236	906	613
8,000	95	61	367	239	942	629
10,000	95	61	370	240	965	640
20,000	96	61	377	243	1,013	661
40,000	96	61	381	244	1,040	672
100,000	96	61	383	245	1,056	679
1,000,000	96	61	384	246	1,066	683
1,000,000,000	96	61	384	246	1,067	683

5.4 Design of Surveys

5.4.1 Review on Previous studies

The significance of questionnaire design for an impelling survey has been highlighted by many researchers (Giritli, *et al.* 1990, Kim 2010, Lingard *et al.* 2010). Accordingly, a well designed questionnaire contains questions that respondents can tackle and answer without putting in much of the effort, which maintain their interest, and at the same time does not consume much of their time . Rate of response is influenced by numerous factors, such as the questionnaire's sizes and dimensions, type and color of paper used, cover pages, questions order, as well as the stamps and envelope used to mail the questionnaire(Memili *et al.* 2011).Moreover, researchers are in favor of mixed- mode survey in order to obtain a

better response rate. In this study, mixed mode survey was adopted, some respondents were interviewed and others were surveyed by mailed questionnaire. To achieve a high response rate there is combined survey method is highly recommended (Mbachu 2008). Technological developments have also given rise to self-administering surveys such as web, electronic mails, and touch-tone data entry methods.(Dillman 2000) formulated the Tailored Design Method to reduce survey error and to enhance response rates.

There are many ways to create sense of increased rewards, decrease social costs for being a survey respondent, and build respondent trust (Dillman 2000). Provision of rewards to respondents can be made by monetary or material incentives, ask for advice, make the questionnaire interesting, inform respondents that opportunities to respond are scarce, and offer a result summary. Respondents' cost can be reduced by providing stamped and addressed return envelopes, by assuring confidentiality or anonymity and making questionnaires appear short and easy.

5.4.2 Design of Surveys

(Dillman 2000) Tailored Design Method is adopted for survey in this thesis. Points taken care of during survey include:

Providing rewards

- Use of complimentary phrases, such as "thank you for completing this questionnaire" etc.
- Respondents are given importance by exhibiting them that they are part of a carefully selected sample as per their experience and professionalism in the construction business.
- The significance of the study and its importance and relevance to the respondent's firm are also expressed in the covering letter of the questionnaire.
- The sharing of the primary findings of the study with respondents.

Reducing the cost for being a respondent

- Questionnaire adapted was mostly having five point likert scale questions which require lesser time to answer as compare to open ended questions. Moreover it also reduces the mental effort of respondents while selecting the answer from a range of responses.

- The structure of questionnaire was providing a vertical flow to the respondents while answering questions and all the questions were grouped under various sections by content.

- On the basis of availability of email address questionnaires were also emailed to the respondents at their convenience.

Establishing trust

- The covering letter was printed on the letterhead with the university logo.

- The complete address, email and other contact information pertain to the researcher were also provided on the covering letter.

- Respondents were also assured that their confidentiality would be maintained and use of data would be restricted to the present study only.

According to (Dillman 2000), follow-up actions have tremendous effects on response rates. He also stated that without follow-up, the response rates would be much lesser no matter how inspiring the mail package or interesting the questionnaire is. In present survey, two follow up were conducted after two and four weeks of the first mailing. However, researchers have to have a balance of the time and cost while implementing the follow-up (McGuinness 2008, Parrod *et al.* 2007).Specimen of the covering letter and questionnaire used in this thesis are exhibited in the Appendix A.

5.4.3 Reliability and Validity of Surveys

As discussed above, Tailored Design Method is helpful to boost response

rates. The reliability and validity of a study determines that the research instrument fulfill its intended purpose for which it is designed. "*Reliability* refers to the consistency of a measure and to the probability of obtaining similar results if the measure is to be duplicated" (Oppenheim 1992). Reliability can be measured in various ways, including the split-half, test-retest reliability, the parallel-form methods, and the internal consistency. Most commonly used method in researches is internal consistency.

"Validity determines whether the score or question can measure what it is supposed to measure"(Oppenheim 1992). To ascertain the validity and reliability and of a questionnaire, researchers use numerous methods. As such, some will refer to the research instrument used in previous studies already been proven valid and reliable. The same approach was adopted in this study with small modifications made to the questionnaire to suite the local construction industry requirements. Then a pilot survey along with the interviews of selected construction experts was conducted to judge its reliability and validity in the local environment. Prior to selecting the questionnaire, a comprehensive literature review is conducted and a questionnaire redrafted by incorporating modifications. Subsequently, pilot survey and interviews with selected academic researchers and professionals associated with the construction industry are carried out to improve the questionnaire's reliability and validity. These approaches found effective subsequently during the statistical analysis of collected data. The data was analyzed using ms excel and statistical package for social sciences (SPSS-17) with the application of frequency analysis and one way ANOVA and Kruskal-Wallis test for parametric and non parametric data respectively test to find out the significant difference between the opinion of client ,consultant and contractors on any particular aspects of subcontracting .

5.5 Data Analysis Technique

5.5.1 Test for Normality

An evaluation of the data normality is a precondition for the use of numerous statistical tests. A more thorough test of normality suitable for data sets of about two thousand elements or less is presented by the Shapiro-Wilk test. To

count as sufficiently normal, the Sig. value should be non significant (that is, it should be larger than .05).For the data set more than 2,000 values Kolmogorov-Smirnov test, also known as K-S Lilliefors, is more suitable . Shapiro-Wilk test is used in this study to check the normality owing to limit of sample size.

5.5.2 Kruskal-Wallis Test and one way ANOVA

The Kruskal-Wallis one-way analysis-of-variance is used to determine whether three or more independent groups (client, consultant and contractor) are the identical or diverse on some variable of interest when an ordinal level of data or an interval or ratio level of data is available. It is more appropriate for finding statistical evidence of *inconsistency* or difference across the means of the various groups. The Kruskal-Wallis test is used for non parametric data whereas one way ANOVA is used for parametric data.

5.6 Summary

This research study uses multiple or mixed research methods. Questionnaire Survey was adopted as the main research instrument. In this chapter, the research method and design, sampling techniques, and design of the survey are discussed; in addition various other theoretical methods used in this research are also mentioned. Above discourse provide a clear understanding and comprehension of the research methodology used in this thesis.

Chapter 6

RESULTS & DISCUSSION

6.1 Introduction

Globally, Construction industry is considered to be a vital industry for the development of a country. Immensely the progress and development of a country is by and large determined by the level of excellence of its construction companies and their potential. Despite being one of the most ignored and neglected sectors in Pakistan, labor Force Survey Report-Government of Pakistan, 2005-06 states that ,construction contributes to amplify and increase the GDP and comprises about 14% of employment of total labor force(FBS 2005). The construction industry in Pakistan plays an imperative role in enhancing aggregate economy as well as reducing unemployment. The construction sector has a linkage with almost forty building material manufacturing industries therefore it provide opportunities for investment and development. It also helps in alleviating poverty by providing employment and income generations. According to economic Survey of Pakistan 2004-05 It rendered jobs to 5.5 per cent of the total working labor force or to 2.43 million individuals, (2.41 million male and 0.2 million female) during 2003-04 (GOP 2005). Regrettably the construction segment is one of the most disregarded sectors in Pakistan. It is at decline which can be evaluated from the reality that "Per capita utilization of cement in Pakistan is one of the lowest among the developing countries i.e. 72 kgs"..Sub-contracting is also widely used in Pakistan construction industry .subsequent sections of the chapter would describe the practices of subcontracting in Pakistan construction and the result of survey conducted on subcontracting in Pakistan.

6.2 Sub-contracting in Pakistan construction

In Pakistan construction sector the contracting structure can be segmented into the subcontracting system and direct labor system. The

subcontracting arrangement fall under, labor only subcontracting, material only subcontracting or both. Domestic subcontractors are awarded the subcontract on the discretion of the prime contractor. In Pakistan domestic subcontractors are frequently employed in labor-intensive assignments such as excavation formwork, rebar work of roofing, and painting etc. On the other hand, the client may desire to have a control over the out lay and quality of the construction work, for the purpose he nominates a subcontractor commonly named as nominated sub-contractor. In Pakistan the nominated subcontractors are employed on piling, HVAC, elevators, firefighting and other specialized tasks.

An unconventional and alternative to the labor subcontracting arrangement is the direct labor system. Where main contractors employ direct labor such workers are generally in the basic trades: concreters, carpenters and brick layers. Small teams of such experienced staff are directly employed by the main contractor as their skills are needed throughout the assignment, and therefore there is not a great deal of risk of redundancy and idleness. Direct labor is also used to undertake the complicated assignments which are not adequately definable to be subcontracted. These comprise broad housekeeping and employment at the interfaces of different trade operations.

Unanimously in Pakistan construction industry Subcontracting is considered a superior arrangement that made construction more proficient and catered for the variable fluctuating workload. The cost effect of work done was lesser than employing direct labor. Mostly main contractors execute their contractual assignments through an widespread arrangement of subcontracting and further subcontracting to decrease the overhead cost. As per the perception of Pakistani construction experts current subcontracting system is also very complex in which subcontractors, consecutively, hire subcontractors, ending up in various layers of subcontracting, which necessitate "overhauling". Moreover it is intricate to prevent the practice of further subcontracting because of the lack of substantiation and evidence of subcontracting, contract agreement between contractor and subcontractor were hardly ever written down nor detailed. Figure 6.1 shows system of contracting in Pakistan.

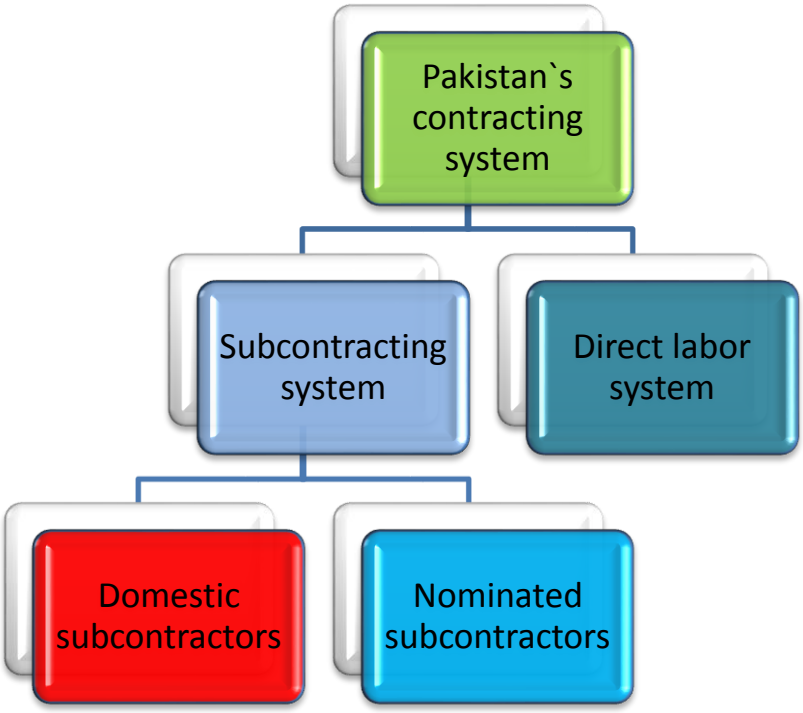

Figure 6.1: System of contracting in Pakistan

Even though the subcontracting is being practiced extensively in Pakistan construction industry it's hard to find any prior studies on subcontracting in the local context. Even pure subcontractors are widely "dispersed", with no authenticated listing, and are therefore hard to trace. Presently, there is no register of subcontractors in Pakistan .Most of the information are gathered from survey and interviews with selected academic researchers and professionals associated with the local construction industry. Results of the present survey portray further insight into local subcontracting practices besides extensive literature review earlier discussed in the study.

6.3 Survey of Subcontracting Practices - Results

6.3.1 Grouping of respondents

There are 69 valid replies out of 130 showing a response rate of 53%.Grouping and frequency is shown in table 6.2:

Table 6.1: Grouping of Respondents

Respondents	Frequency	Percent	Valid Percent	Cumulative Percent
Client	***17***	24.6	***24.6***	24.6
Consultant	***19***	27.5	***27.5***	52.2
Contractor	***33***	47.8	***47.8***	100.0
Total	***69***	100.0	***100.0***	

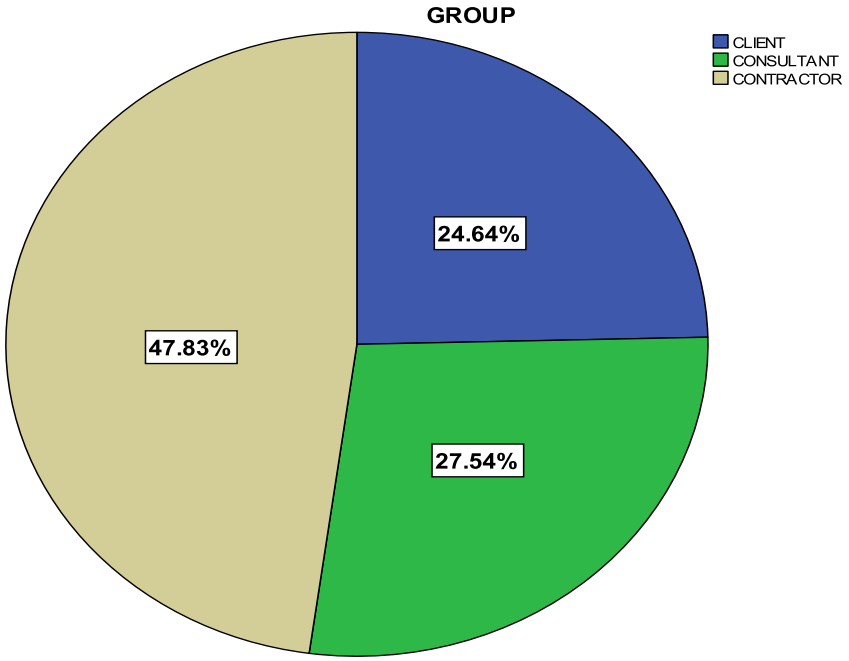

Figure 6.2: Grouping of correspondents

Around 55% of the respondents had accumulated over 10 years of relevant experience in the industry, and about 45% having 5-10 years construction related experience. Therefore the information provided by these professionals was considered to be authentic and reliable.

6.3.2 Companies / respondents profile

Q1 Principal activity of the company

Almost 80% of the respondents belong to building construction. Details of the remaining activities of the companies are shown in table 6.3:

Table 6.2: Principal Activities of Companies

Activity	Frequency	Percent	Valid Percent	Cumulative Percent
Building Construction	55	***79.7***	79.7	79.7
Piling	1	1.4	1.4	81.2
Civil Engineering	13	18.8	18.8	100.0

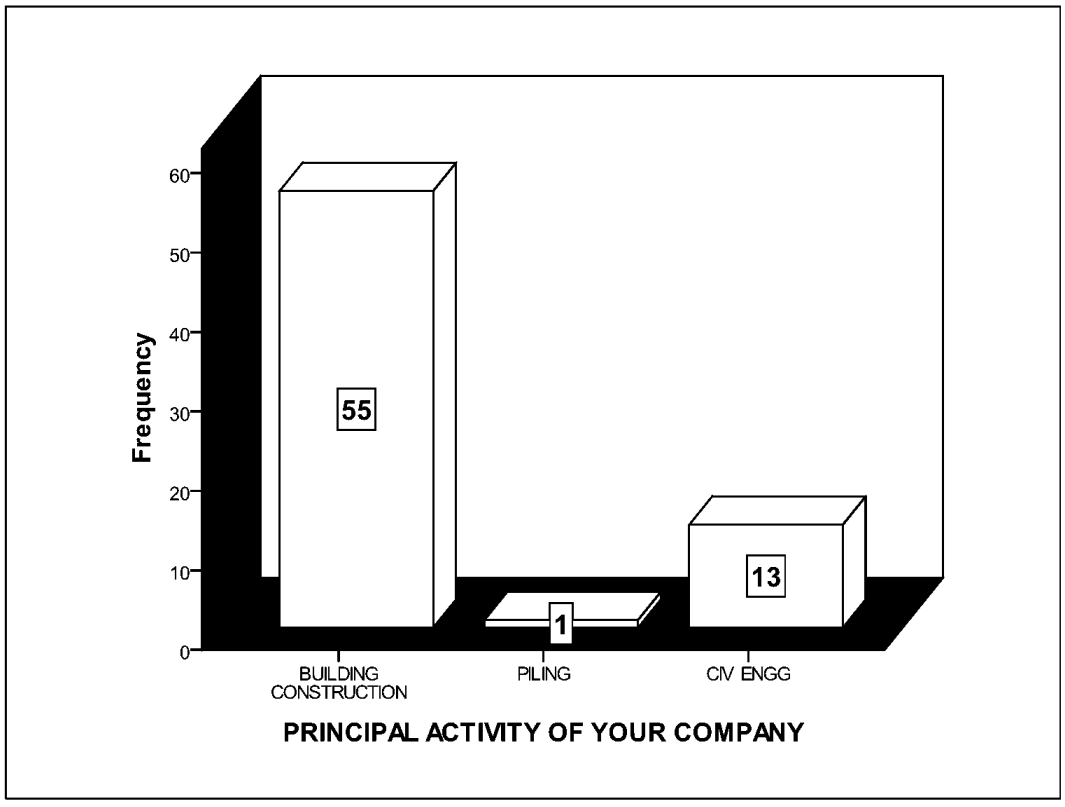

Figure 6.3: Principal activities of your companies

Q2 Employees in the company

The strength of company's full time employees varies significantly. Resultantly these have great diversification in their organization and structure. The average strength is shown in table 6.3:

Table 6.3a: Employees in the Company

	Statistics	Group	How Many Full Time Managerial Employees	How Many Full Time Supervisory Employees	How Many Full Time Workers Employees	Sum of 2a+2b+2c=
N	Valid	69	69	69	69	69
	Missing	0	0	0	0	0
Mean		2.23	16.19	31.55	125.39	173.28
Median		2.00	10.00	25.00	80.00	130.00
Mode		3	10	10	0	85
Std. Deviation		.825	15.784	29.291	137.735	153.261
Range		2	79	120	600	654

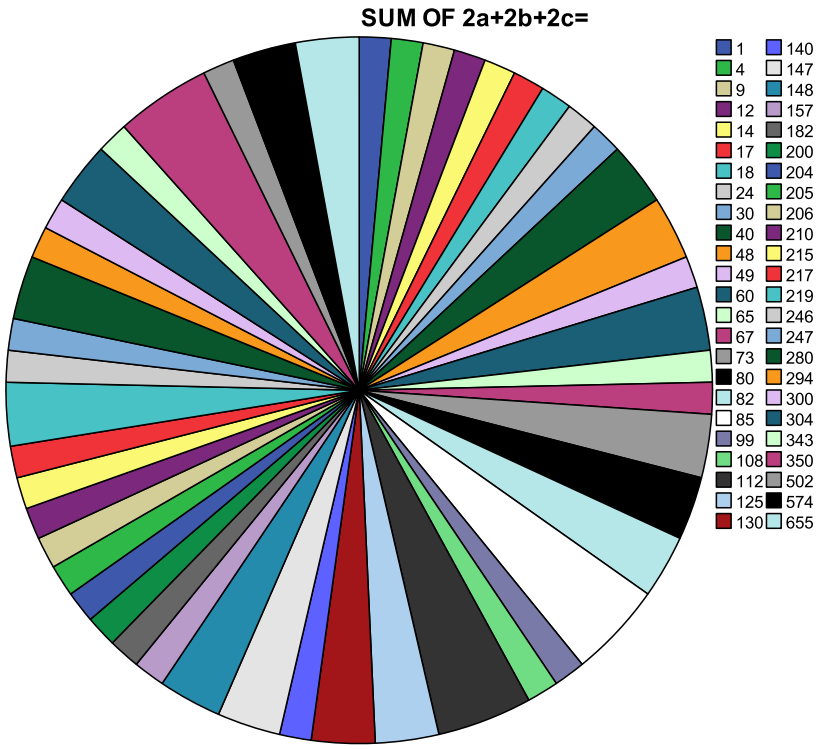

Figure 6.4: Company size

For easy comprehension of company size frequency distribution of data is shown below.

Table 6.3b: Employees in the Company

Category (Employees)	No 0f Companies	Percentage
Category 1(1-150)	38/69	55
Category 2(151-300)	16/69	23
Category 3(301-450)	8/69	11.6
Category 4(451-600)	7/69	10.4

Q3. Company Age

Respondent Companies have their age between three to thirty six years. Average age of the respondent companies is more or less seventeen years.

Table 6.4: Company Age

N	Valid	69
	Missing	0
Mean		***17.22***
Median		16.00
Mode		20
Std. Deviation		8.298
Range		33

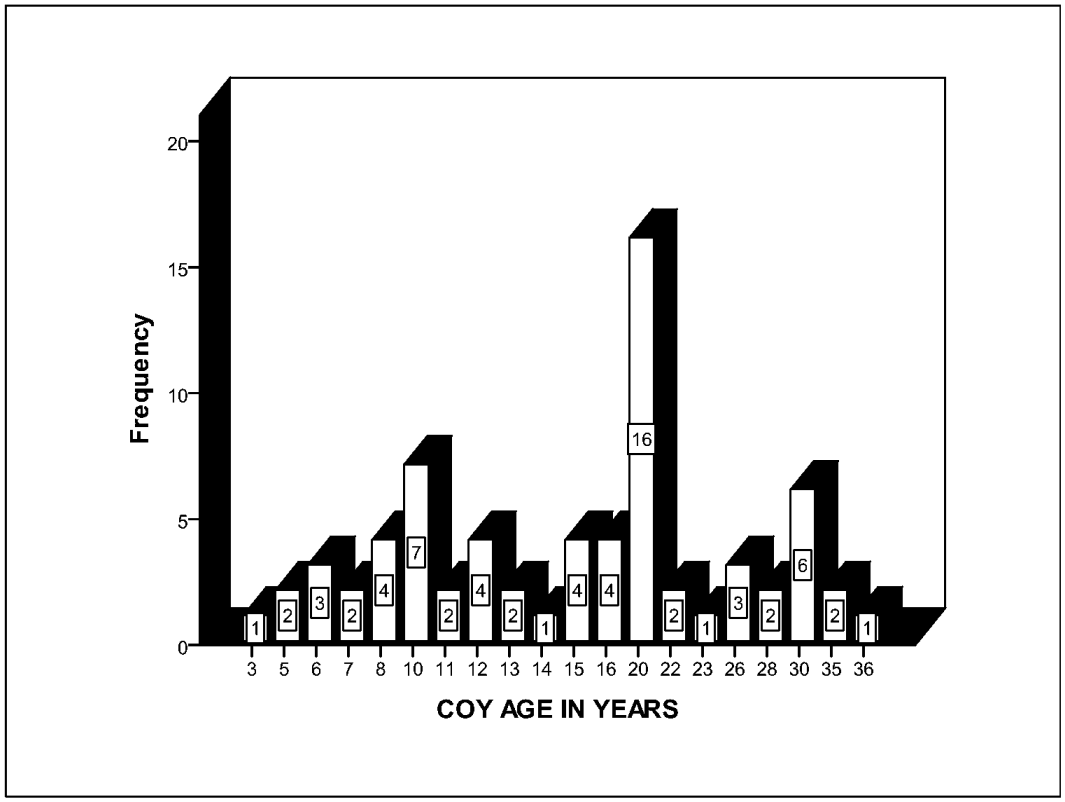

Figure 6.5: Company age

6.3.3 Extent and involvement of subcontracting

Q4. Frequency of subcontracting

The investigation data established that subcontracting was indeed very extensive. Responses in each category are shown in table 6.5:

Table 6.5: Frequency of Subcontracting

Categories		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	38	55.1	***55.1***	55.1
	Mostly	29	42.0	***42.0***	97.1
	Sometimes	2	2.9	2.9	100.0
	Total	69	100.0	100.0	

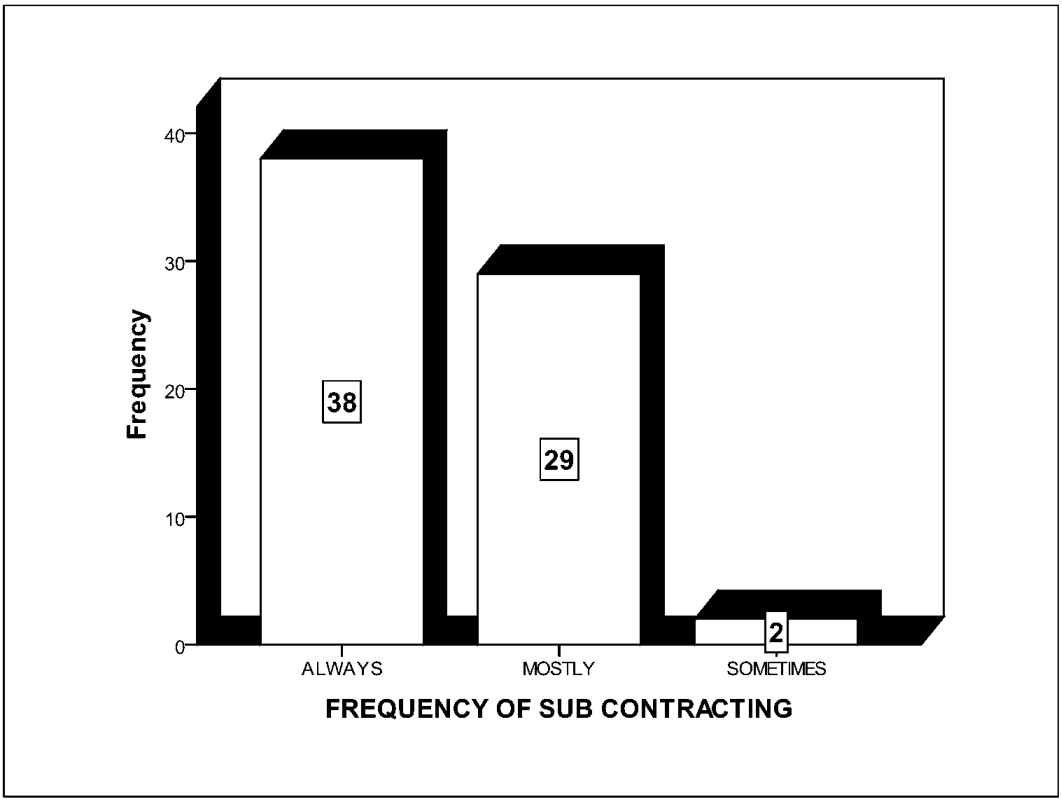

Figure 6.6: Frequency of subcontracting

To check the statistics to be used for analysis, Shapiro Wilk normality test was conducted and significance value found was .00<.05,which is a clear evidence for the

use of non parametric tests for data analysis. Table 6.6 shows the data regarding test of normality by Shapiro Wilk:

Table 6.6: Shapiro Wilk Test for Normality

Frequency of Subcontracting	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Always	.313	38	.000	.751	38	***.000***
Mostly	.284	29	.000	.769	29	***.000***
Sometimes	.260	2	.			

a. Lilliefors Significance Correction

Subsequently the non parametric tests conducted for the analysis of data by comparing the means is Kruskal Wallis test. Attributes of the tests have already been discussed in previous chapter.

Here table 6.7 of Kruskal Wallis Test shows much higher significance value (.922>.05), which depicts that there is no significant difference between the perception of client, consultant and contractors regarding wide spread use of subcontracting .Group wise perception is also shown in table 6.8 below:

Table 6.7: Kruskal Wallis Test

Stat	Frequency of Sub Contracting
Chi-square	.163
Df	2
Asymp. Sig.	***.922***

a. Kruskal Wallis Test

Table 6.8: Frequency of Subcontracting

GROUP			Frequency	Percent	Valid Percent	Cumulative Percent
Client	Valid	Always	9	52.9	***52.9***	52.9
		Mostly	8	47.1	***47.1***	100.0
		Total	17	100.0	***100.0***	
Consultant	Valid	Always	10	52.6	***52.6***	52.6
		Mostly	8	42.1	***42.1***	94.7
		Sometimes	1	5.3	***5.3***	100.0
		Total	19	100.0	***100.0***	
Contractor	Valid	Always	19	57.6	***57.6***	57.6
		Mostly	13	39.4	***39.4***	97.0
		Sometimes	1	3.0	***3.0***	100.0
		Total	33	100.0	***100.0***	

Q5. Number of main and subcontract undertook by company

Over the last 3 years, companies executed more than 81%works as main contractors. The remaining 19 % also worked as subcontractors during that period in addition to main contractors on some other projects. So according to quantum of project and capacity of contractors their role was interchangeable. None of them was a pure subcontractor.

Table 6.9: Number of Contract Executed

Stat		Over Last Three Years How Many Contracts Undertaken	In How Many You Were Main Contractor	In How Many You Were Sub Contractor
	Valid	69	69	69
	Missing	0	0	0
Mean		19.78	15.88	3.87
Median		10.00	9.00	1.00
Mode		10	3	0
Range		79	74	40
Minimum		1	1	0
Maximum		80	75	40

Q6 Resources provided by subcontractor

Table 6.10: Labor Provided by Subcontract

Categories		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Always***	***44***	***63.8***	63.8	63.8
	Mostly	***25***	***36.2***	36.2	100.0
	Total	69	100.0	100.0	

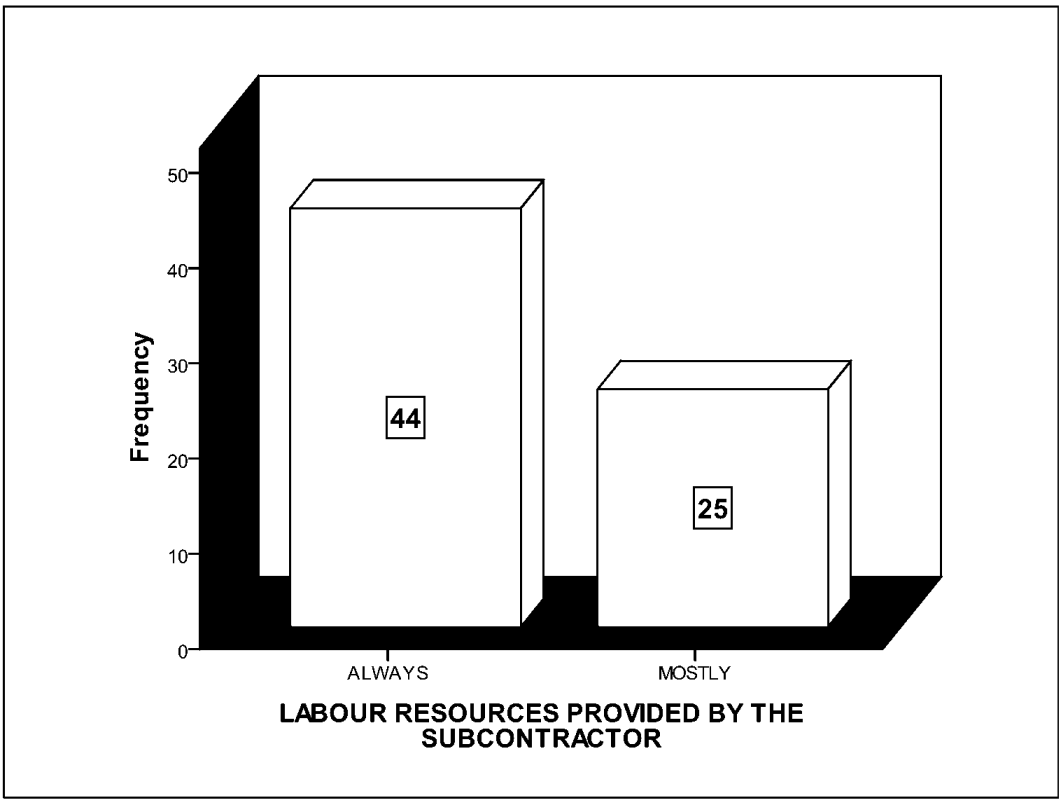

Figure 6.7: Labor resources provided by subcontractor

Table 6.11: Plant Provided by the Subcontractors

	Categories	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Mostly***	***36***	***52.2***	52.2	52.2
	Sometimes	***22***	***31.9***	31.9	84.1
	Occasionally	8	11.6	11.6	95.7
	Never	3	4.3	4.3	100.0
	Total	69	100.0	100.0	

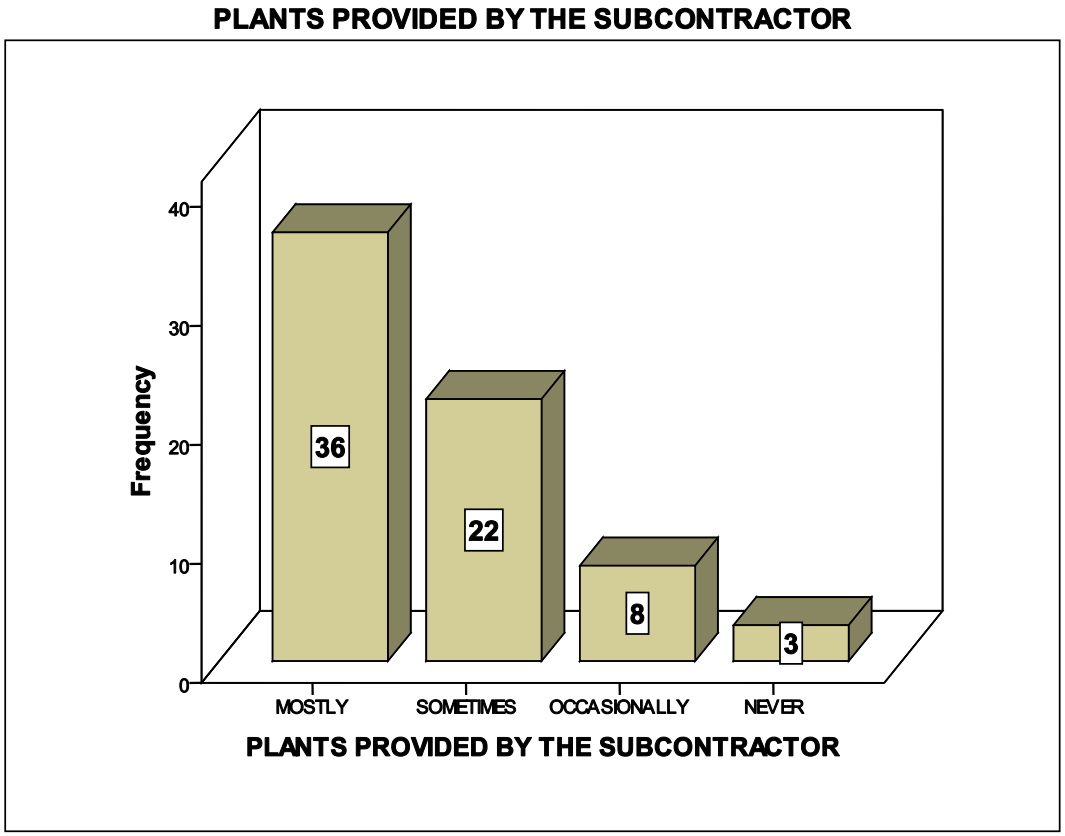

Figure 6.8: Plant provided by subcontractors

Table 6.12: Mateial Provided by the Subcontractors

	Categories	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	4	5.8	5.8	5.8
	Mostly	***18***	***26.1***	26.1	31.9
	Sometimes	***42***	***60.9***	60.9	92.8
	Occasionally	2	2.9	2.9	95.7
	Never	3	4.3	4.3	100.0
	Total	69	100.0	100.0	

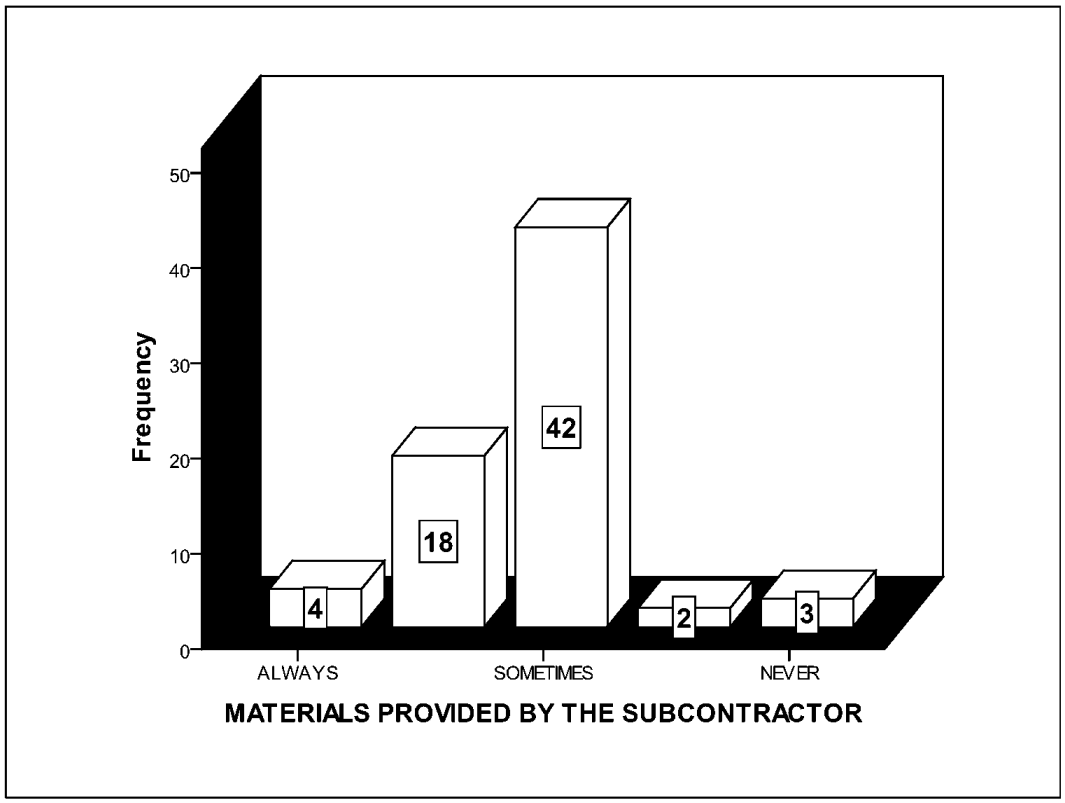

Figure 6.9: Material provided by subcontractors

Table 6.13 below shows relative index by comparing the mean, the mean value for provision of labor is 1.36 which shows that it lies between always(have coding 1) and mostly(have coding 2)and similarly plant provision mean 2.68 lies between mostly(have coding 2) and sometimes(have coding 3) and so on .It shows comparison of resources provided in the scope of subcontracting . Labor is the most significant among all with the lowest mean because 1 is highest and 5 is lowest, lower the mean higher the significance.

Table 6.13: Comparison of Mean

Resources	N	Mean
Labour Resources Provided By The Subcontractor	***69***	***1.36***
Plants Provided by the Subcontractor	69	2.68
Materials Provided by the Subcontractor	69	2.74

Table 6.14 of Kruskal Wallis Test shows higher significance values (>.05), which shows that there is no significant difference between the perception of client, consultant and contractors regarding resources provided by the subcontractors .Group wise perception is also shown in table 6.15 below:

Table 6.14: Resources Kruskal Wallis Test

Stat	Labour Resources Provided By The Subcontractor	Plants Provided By The Subcontractor	Materials Provided By The Subcontractor
Chi-Square	.353	3.894	.385
Df	2	2	2
Asymp. Sig.	***.838***	***.143***	***.825***

a. Kruskal Wallis Test

Table 6.15: Resources Respondents Perception

GROUP			Frequency	Percent	Valid Percent	Cumulative Percent
Client	Valid	Always	10	58.8	58.8	58.8
		Mostly	7	41.2	41.2	100.0
		Total	17	100.0	100.0	
Consultant	Valid	Always	13	68.4	68.4	68.4
		Mostly	6	31.6	31.6	100.0
		Total	19	100.0	100.0	
Contractor	Valid	Always	21	63.6	63.6	63.6
		Mostly	12	36.4	36.4	100.0
		Total	33	100.0	100.0	

Above analysis shows that generally labor and plant is provided by the subcontractors where as provision of material is not very common as for as scope of subcontracting is concerned.

6.3.4 REASONS FOR SUBCONTRACTING

Q7.Being main contractor why did you offer subcontract?

Table 6.16: Reasons for Subcontracting

Stat	Traditional	Lack Specialize Skill	Beyond Capacity	Reduce Cost	Reduce Risk	Save Time	Absorb Fluctuation	Maintain Relations	Tax Advantage
Mean	3.84	2.57	3.26	***2.07***	3.17	***2.04***	2.20	3.36	4.67

Q8 Being subcontractor why did you undertake a subcontract?

Table 6.17: Reasons of Subcontracting by Subcontractor

Comments		To Increase Profit	To Reduce Losses	To Increase Volume	To Maintain Relationships
N	Valid	69	69	69	69
	Missing	0	0	0	0
Mean		***2.33***	3.10	2.38	***2.23***

It is observed that nearly all respondents have multiple reasons for the use of subcontracting in construction. Most glaring rationales given by contractors are *to save upon the time* and *reduce cost* .In other words, most of them had subcontracted for a variety of reasons.

6.3.5 Choice of subcontractor

Q9 Do companies keep a list of subcontractors?

All the companies do uphold a list of subcontractors. Selection is made by and large from the list held with the company on *relation* and *performance* basis. Response is shown in table 6.18:

Table 6.18: List of Subcontractors with Companies

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	69	***100.0***	100.0	100.0

Q10a. How many subcontractors on the list?

List of subcontractors maintained by the companies ranging from 5 to 200, having an average of 66 and mode 50.

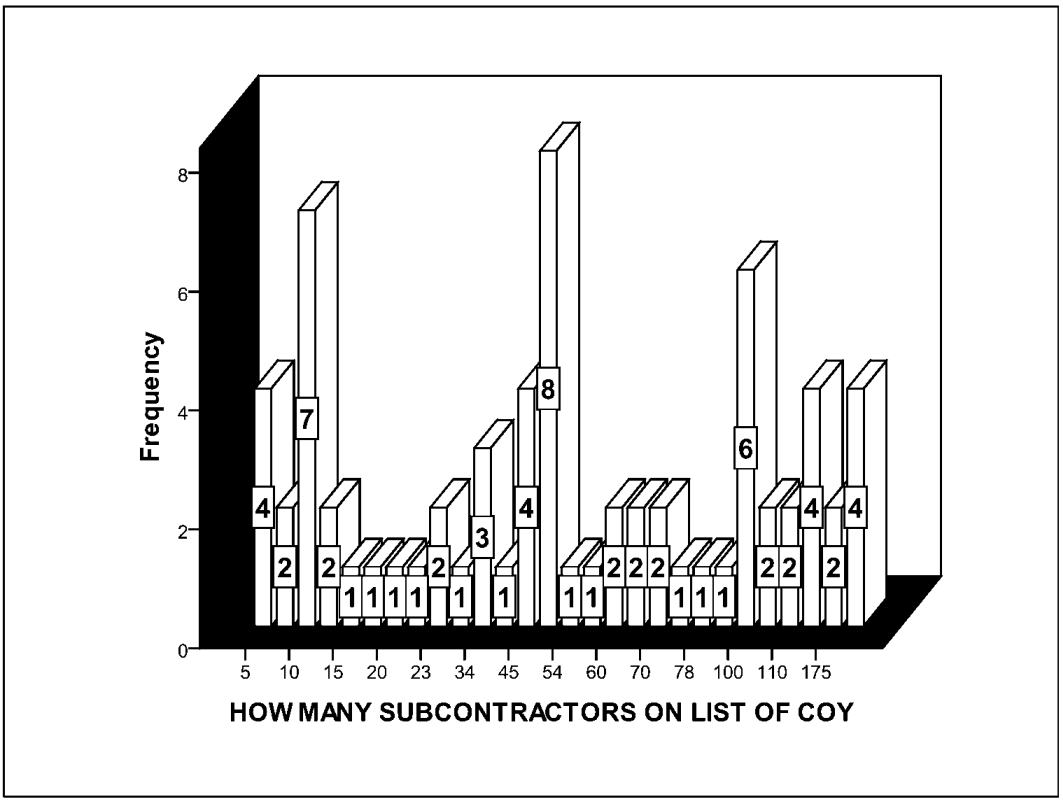

Figure 6.10: Number of sub contractors with the companies

Q10b. Do you review the list regularly on performance basis?

The 94% companies do review their list of subcontractors on the basis of performance where as 6% denied the existence of such evaluation system of subcontractors in their firm. Responses are also shown in the table below:

Table 6.19: Review List of Subcontractors on Performance

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Yes***	***65***	***94.2***	94.2	94.2
	No	4	5.8	5.8	100.0
	Total	69	100.0	100.0	

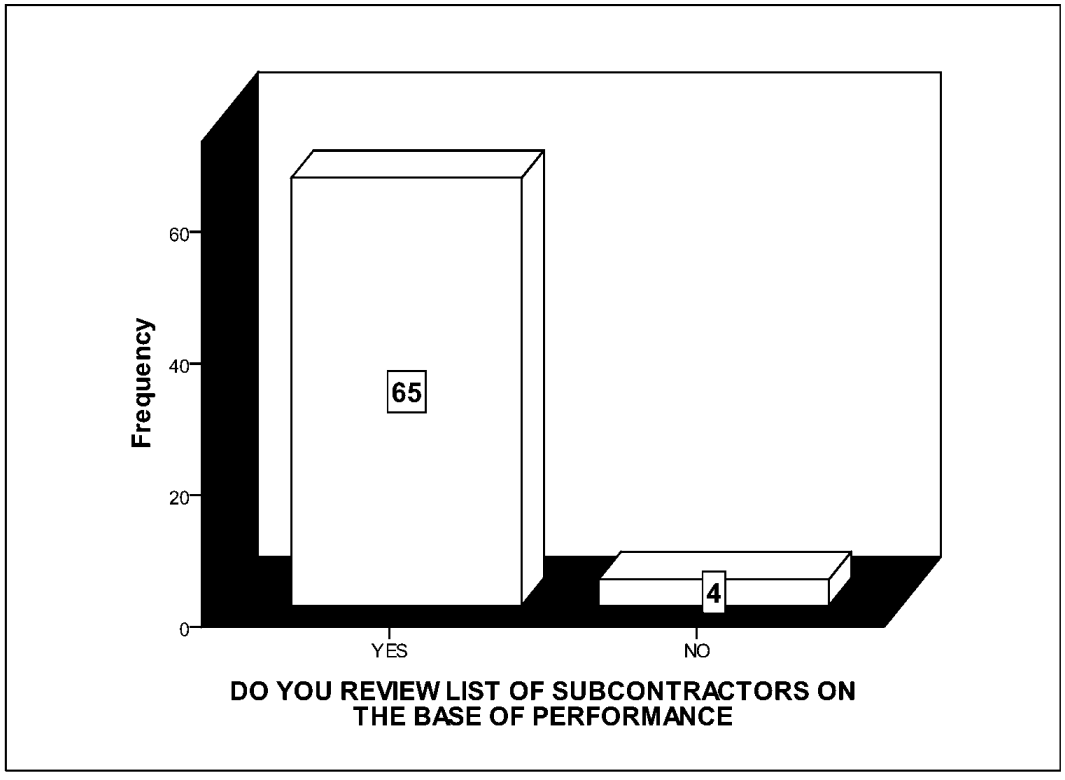

Figure 6.11: Review of subcontractors

Q11. On what basis does a main contractor choose a subcontractor?

The result in table 6.20 shows that most of the respondents considered the *price* as the he most imperative criteria for the selection of subcontractors, subsequently *ability to complete the work on time* and after that, the *quality* of the work.

Table 6.20: Basis for Selection of Subcontractors

Stat		Price	Quality	Ability To Complete Work On Time	Subcontractors Resources	Personal Relationship
N	Valid	69	69	69	69	69
	Missing	0	0	0	0	0
Mean		***1.36***	***1.64***	***1.46***	1.97	3.07
Mode		1	1	1	1	3

Separate perception of client, consultant and contractors is also given in the three tables given below:

Table 6.21: Client Perception on Selection

Criterion	N	Mean
Price	17	1.12
Ability To Complete Work On Time	17	1.53
Quality	17	1.82
Subcontractors Resources	17	1.94
Personal Relationship	17	3.41
Valid N (Listwise)	17	

a. Group = Client

Table 6.22: Consultants Perception on Selection of Subcontractors

Criterion	N	Mean
Ability To Complete Work On Time	19	1.42
Quality	19	1.53
Price	19	1.58
Subcontractors Resources	19	2.00
Personal Relationship	19	2.63
Valid N (Listwise)	19	

a. Group = Consultant

Table 6.23 : Contractors Perception on Selection of Subcontractors

Criterion	N	Mean
Price	33	1.36
Ability To Complete Work On Time	33	1.45
Quality	33	1.61
Subcontractors Resources	33	1.97
Personal Relationship	33	3.15
Valid N (Listwise)	33	

a. Group = Contractor

Table 6.24: Kruskal Wallis Test on Selection of Subcontractors

Stat	Price	Quality	Ability To Complete Work On Time	Subcontractors Resources	Personal Relationship
Chi-Square	5.525	.887	.424	.075	5.611
Of	2	2	2	2	2
Asymp. Sig.	***.063***	***.642***	***.809***	***.963***	***.060***

Above table shows that significance of the factors is>.05, so there is no significant difference of opinion of all three groups on the criteria of selection of subcontractors.

Q12 What is the method to choose a subcontractor?

The most widely used method of *subcontractors selection is through their own maintained list and then invite bids* from those selected ones. Second is *one to one negotiation* where as *open bidding* is the least preferred method. Responses are shown in table 6.25:

Table 6.25: Method Of Selection of Subcontractors

	Stat	Open Bidding	Select and Invite Bids	One to One Negotiation
N	Valid	69	69	69
	Missing	0	0	0
	Mean	***3.52***	***1.59***	***2.70***
	Mode	5	1	3

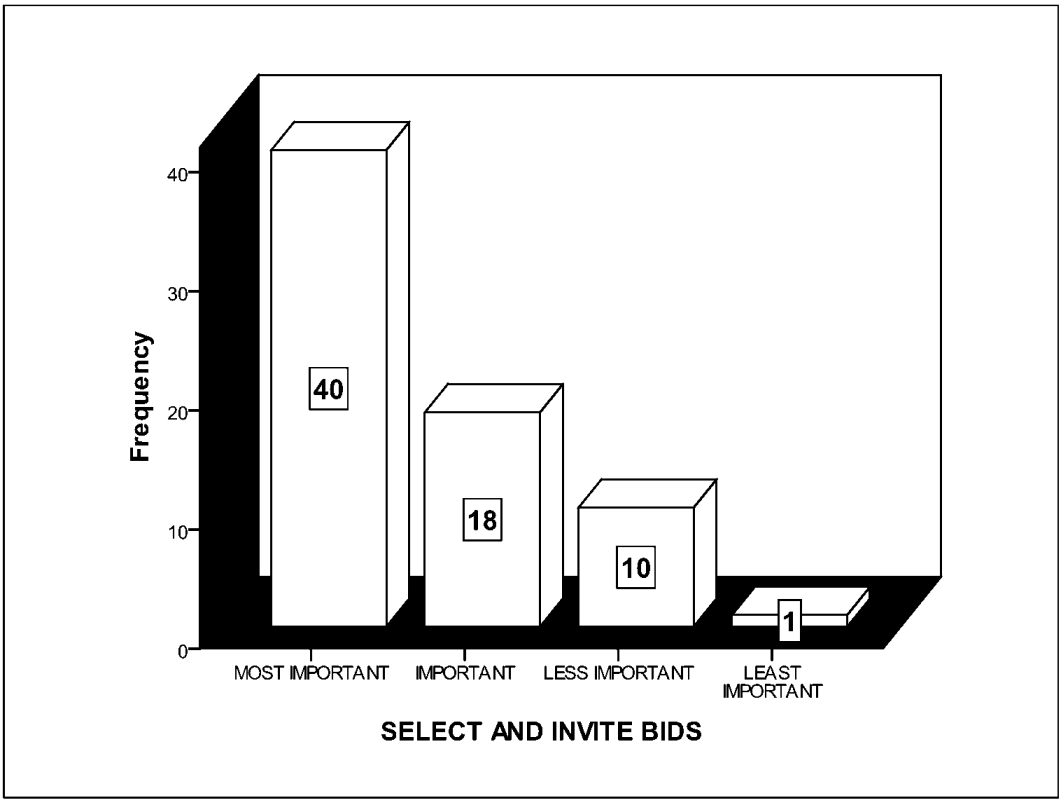

Figure 6.12: Subcontractors Selection methods

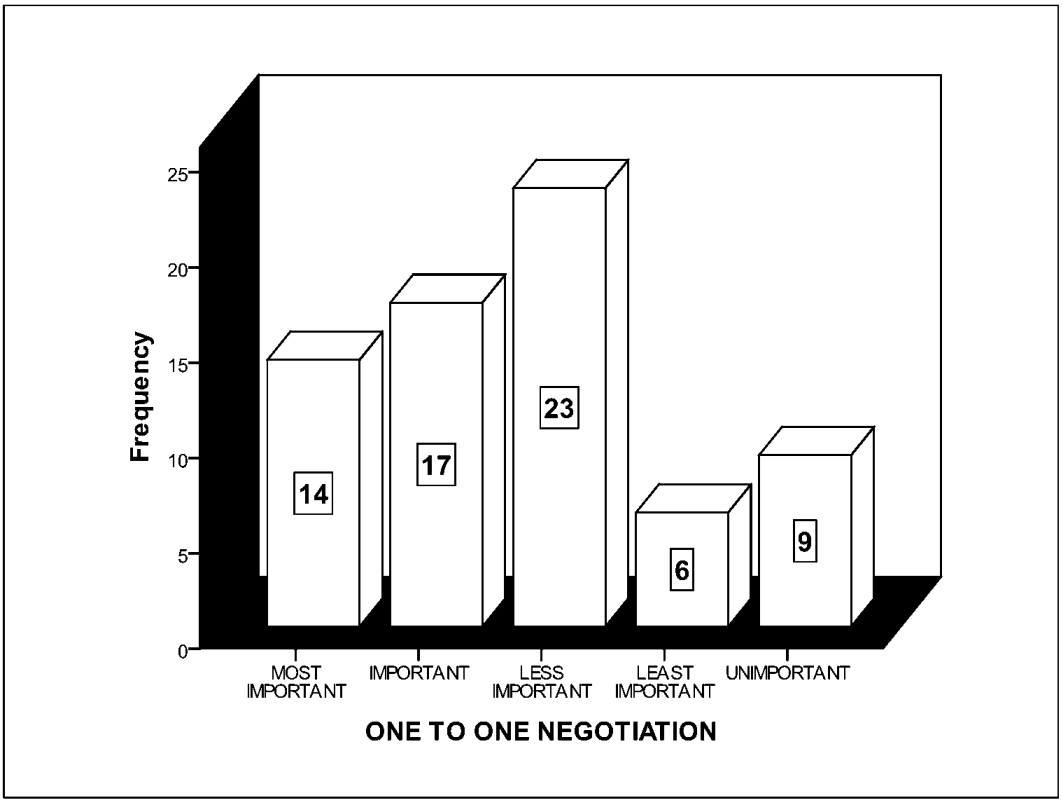

Figure 6.13: Subcontractors Selection methods2

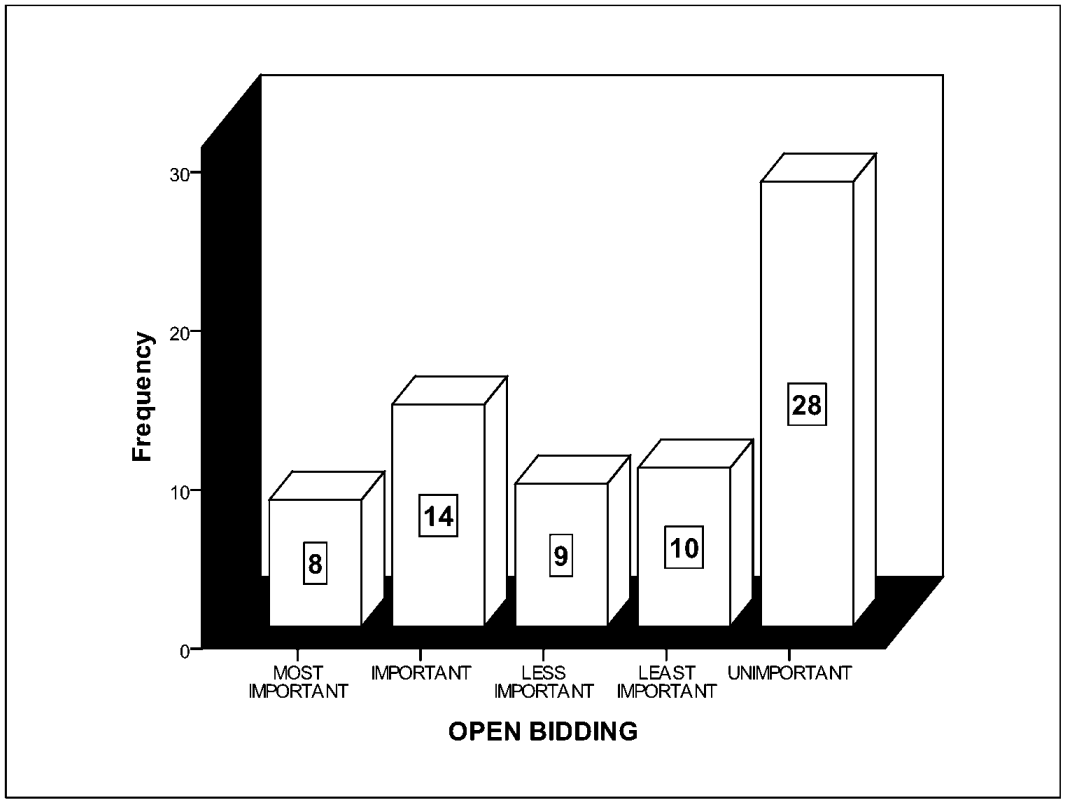

Figure 6.14: Subcontractors Selection methods3

6.3.6 Forms and terms of subcontract

Q13. What is the form of subcontract normally used?

Although 60% of the contracts between the contractor and sub-contractor are written, but not on any standard form of contract having any legal binding or implication. In case of contract between subcontractor and sub subcontractor this figure drops to 21%.

Table 6.26: Forms Of Subcontracts between Main and Subcontractor

	Forms Of Subcontracts	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Written***	***40***	***58.0***	***58.0***	***58.0***
	Written but Not Detailed	19	27.5	27.5	85.5
	Verbal	10	14.5	14.5	100.0
	Total	69	100.0	100.0	

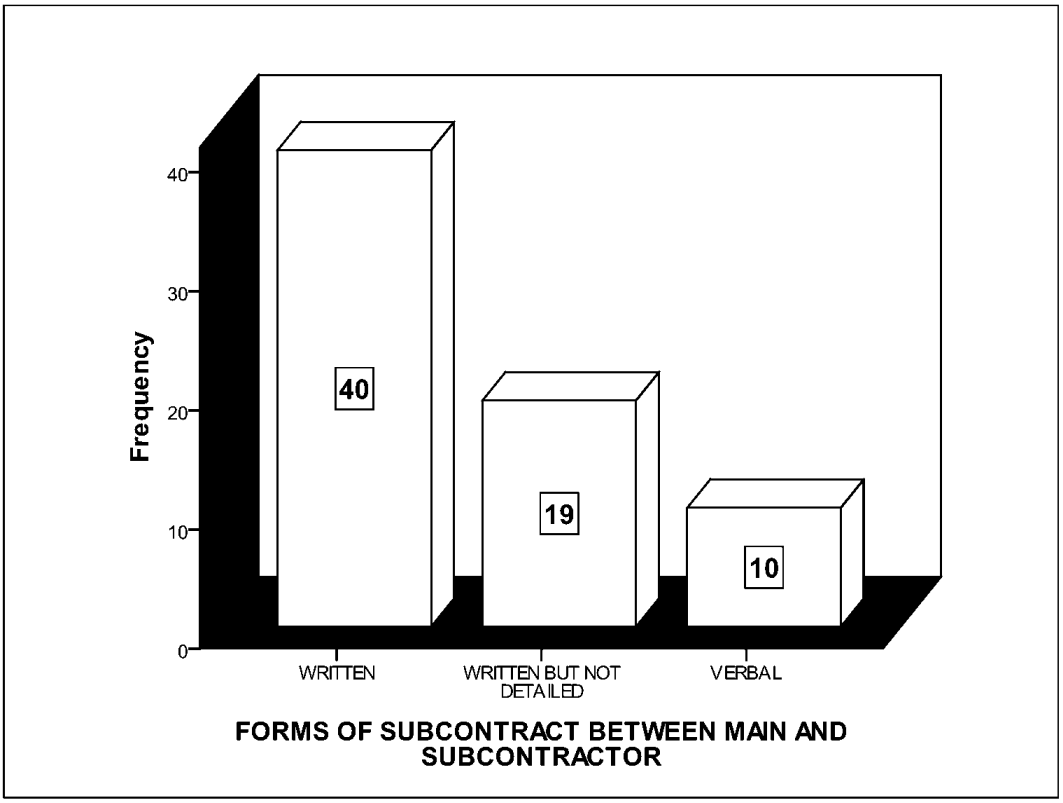

Figure 6.15: Forms of subcontracts

Table 6.27: Forms Of Subcontracts between Subcontractor and Sub-Subcontractor

Forms of subcontracts		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Written	15	21.7	21.7	21.7
	Written but Not Detailed	27	39.1	39.1	60.9
	Verbal	26	37.7	37.7	98.6
	Unknown	1	1.4	1.4	100.0
	Total	69	100.0	100.0	

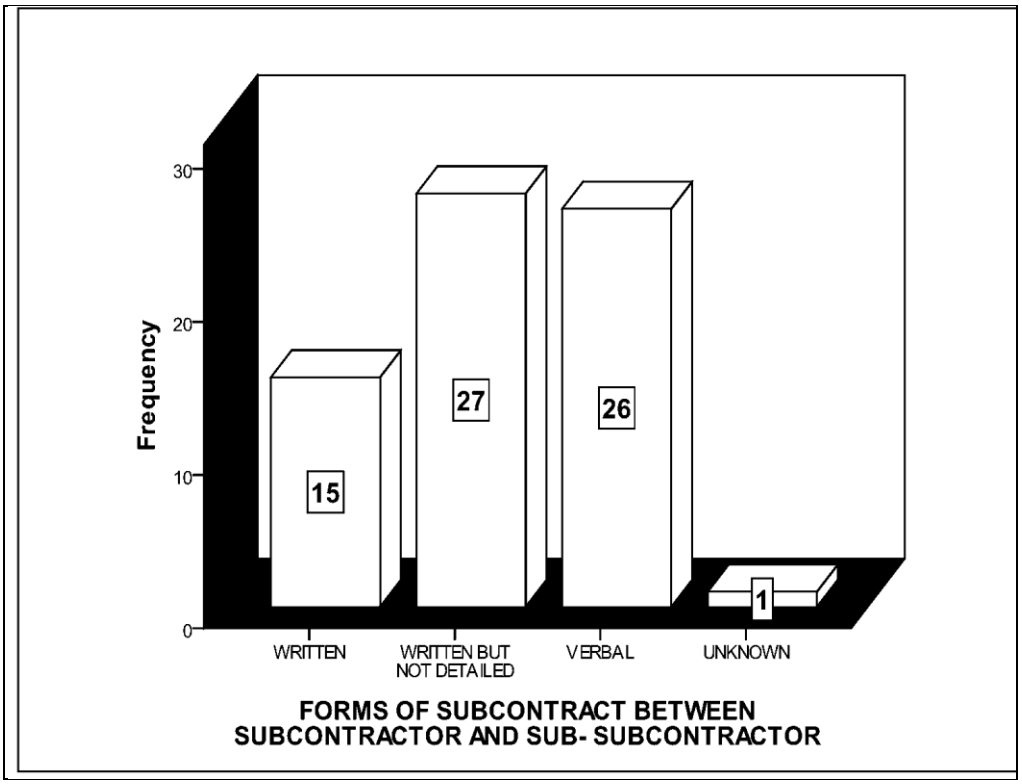

Figure 6.16: Forms of subcontracts 2

Q14. How the terms of subcontract determined?

All the methods to determine the terms of subcontract are in use on one or other account. Percentages of affirmative responses are mentioned in the respective tables below:

Table 6.28: Determined the Contract Terms

Determination of Subcontract Terms Based on Bid by Subcontractor

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Yes***	***35***	***50.7***	100.0	100.0
Missing	System	34	49.3		

Table 6.29: Determined the Contract Terms

Determine Unilaterally by Main Contractor

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***YES***	***36***	***52.2***	100.0	100.0
Missing	System	33	47.8		
Total		69	100.0		

Table 6.30: Determined the Contract Terms

Same Term as Main Contract

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Yes***	***32***	***46.4***	100.0	100.0
Missing	System	37	53.6		
Total		69	100.0		

Table 6.31: Determined the Contract Terms

Direct Negotiation between Two Parties

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***YES***	***26***	***37.7***	100.0	100.0
Missing	System	43	62.3		
Total		69	100.0		

Q15. What is the duration of the most recent subcontract?

Duration of most recent subcontract is ranging between 1 to 40 months.

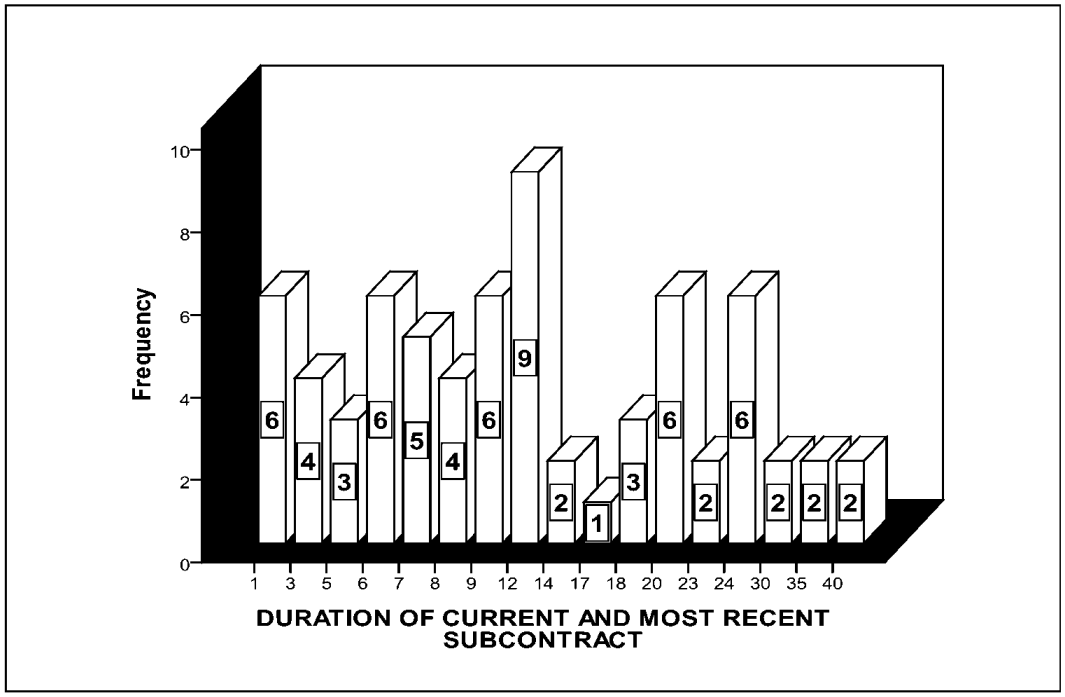

Figure 6.17: Duration of subcontracts

6.3.7 Problems and remedies for subcontracting

Q16. How often does problem arise because of subcontracting?

More than 70% respondents admitted that problems due to subcontracting do arise sometimes. Other responses are also shown in table 6.32:

Table 6.32: Frequency Of Problems due to Subcontracting

	Category	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	6	8.7	8.7	8.7
	Mostly	10	14.5	14.5	23.2
	Sometimes	***49***	***71.0***	71.0	94.2
	Occasionally	2	2.9	2.9	97.1
	Never	2	2.9	2.9	100.0
	Total	69	100.0	100.0	

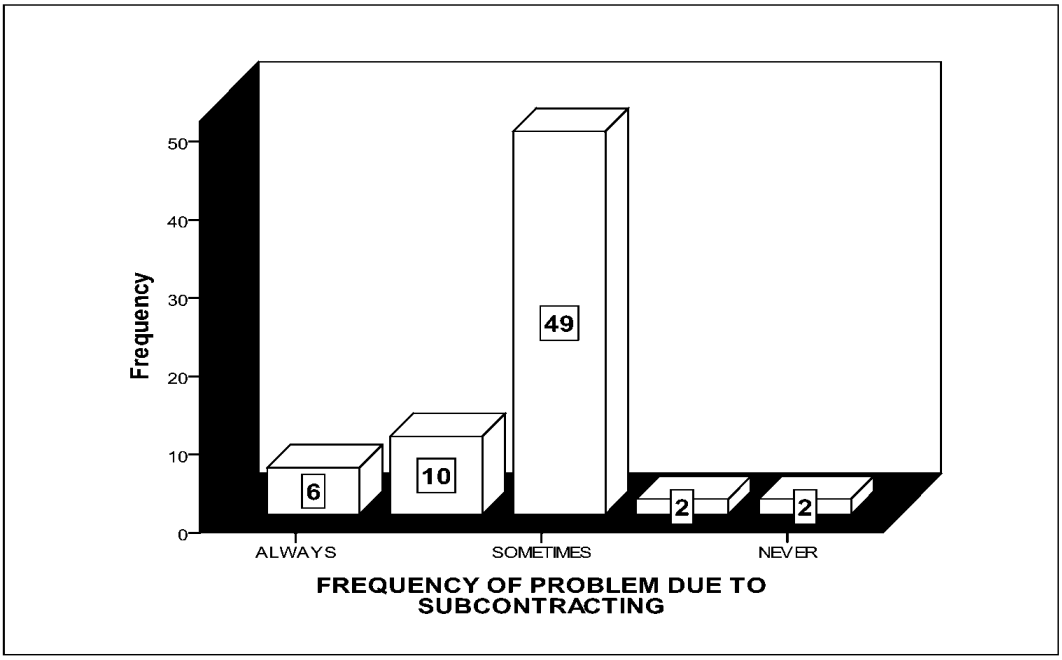

Figure 6.18: Frequency of problems due to subcontracting

Q17. What is the main problem areas?

Unanimously quality has been stated as the major problem area of subcontracting followed by progress and lack of cooperation as shown by the table 6.33 below:

Table 6.33: Main Problem Areas due to Subcontracting

	Stat	Quality	Progress	Lack of Cooperation	Excessive Material Wastage	Difficult to Control or Cordinate Activities
N	Valid	69	69	69	69	69
	Missing	0	0	0	0	0
	Mean	***2. 81***	***2. 35***	***2.94***	3.03	3.03
	Mode	2	2	3	3	3

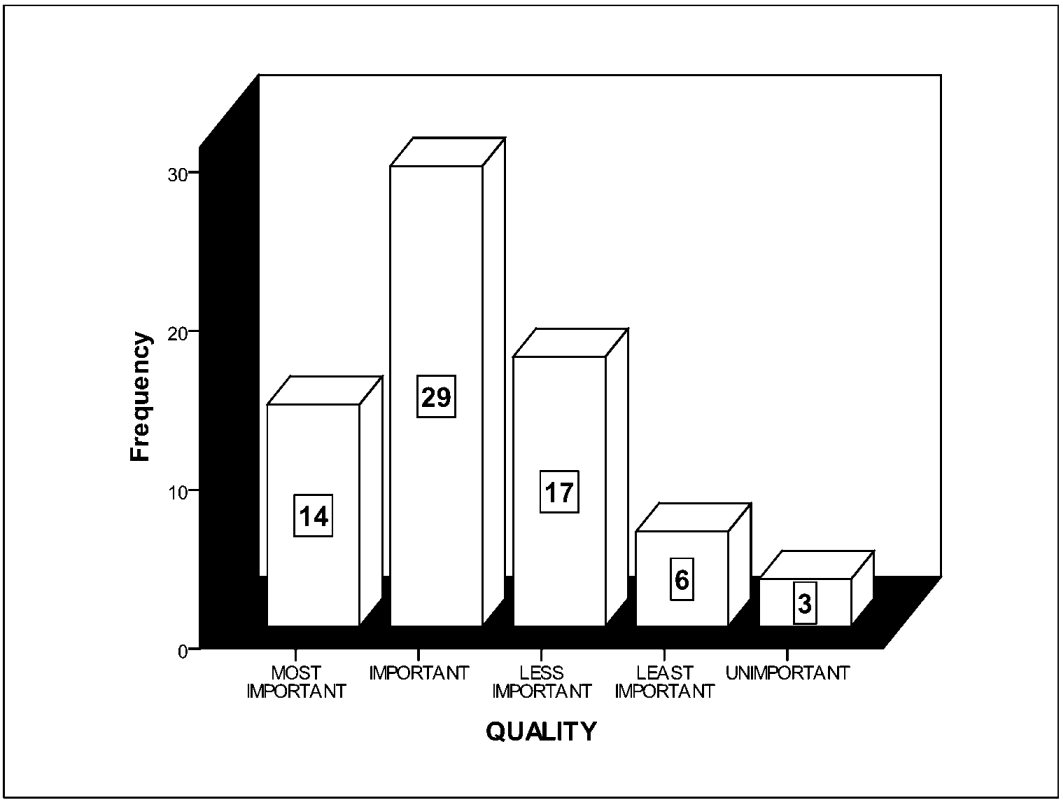

Figure 6.19: Frequency of problems- quality

Kruskal Wallis Test table 6.34 shows significance values >.05, which depicts that there is no significant difference of perception of client, consultant and contractor on the issue of major problem areas of subcontracting.

Table 6.34: Kruskal Wallis Test

Problems due to Subcontracting

Stat	Quality	Progress	Lack of Cooperation	Excessive Material Wastage	Difficult to Control or Coordinate Activities
Chi-Square	.122	.172	.375	.169	2.607
Df	2	2	2	2	2
Asymp. Sig.	***.941***	***.982***	***.829***	***.919***	***.272***

Q18. How the problems are usually resolved?

More than 75% of the respondents stated the long negotiation is the method to resolve the subcontracting problems in Pakistan construction industry. Responses on the other methods are also shown in relevant tables below:

Table 6.35: Resolving Problem

Resolving Problem through Long Negotiation

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	***52***	***75.4***	100.0	100.0
Missing	System	17	24.6		
Total		69	100.0		

Table 6.36: Resolving Problem

Resolving Problem through Arbitration /Mediation

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	***13***	***18.8***	100.0	100.0
Missing	System	56	81.2		
Total		69	100.0		

Table 6.37: Resolving Problem

Resolving Problem through Legal Action

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	***5***	***7.2***	100.0	100.0
Missing	System	64	92.8		

Table 6.38: Resolving Problem

Subcontractor Simply Abandoned the Job and Disappeared

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	***16***	***23.2***	100.0	100.0
Missing	System	53	76.8		
Total		69	100.0		

6.3.8 Use of sub subcontracting

Q19. Frequency of sub subcontracting

Respondents confirmed the extensive use of sub- contracting in Pakistan construction industry. Table 6.39 shows the responses on the use of sub subcontracting in Pakistan.

Table 6.39: Frequency of Sub Subcontracting

Frequency		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	10	14.5	14.5	14.5
	Mostly	***30***	***43.5***	43.5	58.0
	Sometimes	***22***	***31.9***	31.9	89.9
	Occasionally	7	10.1	10.1	100.0
	Total	69	100.0	100.0	

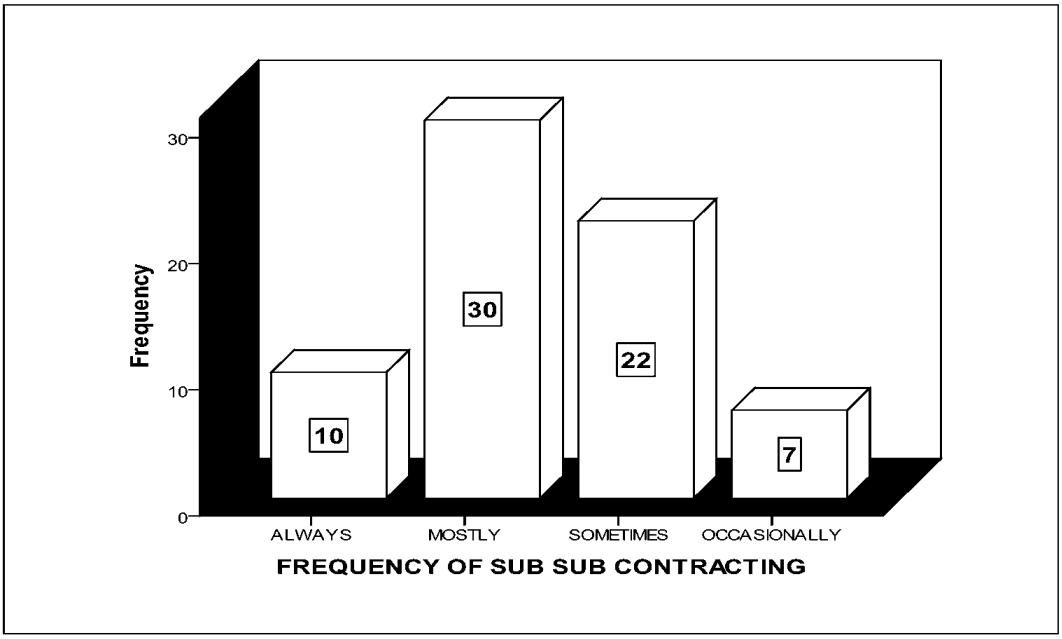

Figure 6.20: Frequency of sub subcontracting

Q20 .Control of main contractor over the choice of sub subcontractor:

Respondents established that they have a very minute control over the choice of sub subcontractors. Table 6.40 below shows the responses on the issue of choice of sub sub contractors.

Table 6.40: Control of Main Contractor

	Control	Frequency	Percent	Valid Percent
Valid	Very Much	5	7.2	7.2
	Much	9	13.0	13.0
	Little	***25***	***36.2***	36.2
	Very Little	***14***	***20.3***	20.3
	Not At All	***16***	***23.2***	23.2
	Total	69	100.0	100.0

6.3.9 Performance and satisfaction with sub contracting.

Q21. How does you rate performance of subcontractor or subcontracting in general?

Respondents have graded the performance of subcontractors fairly good. Responses are shown in the table below. The significance value of Kruskal Wallis Test .991>.05 also demonstrate the consistency among the perception of clients, consultants and contractors on the issue of performance of subcontracting.

Table 6.41: Performance of Subcontractors

Performance		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Good***	***29***	***42.0***	42.0	42.0
	Fair	***38***	***55.1***	55.1	97.1
	Bad	2	2.9	2.9	100.0
	Total	69	100.0	100.0	

Table 6.42: Kruskal Wallis Test on Performance

Stat	Performance of Subcontractors
Chi-square	.018
df	2
Asymp. Sig.	***.991***

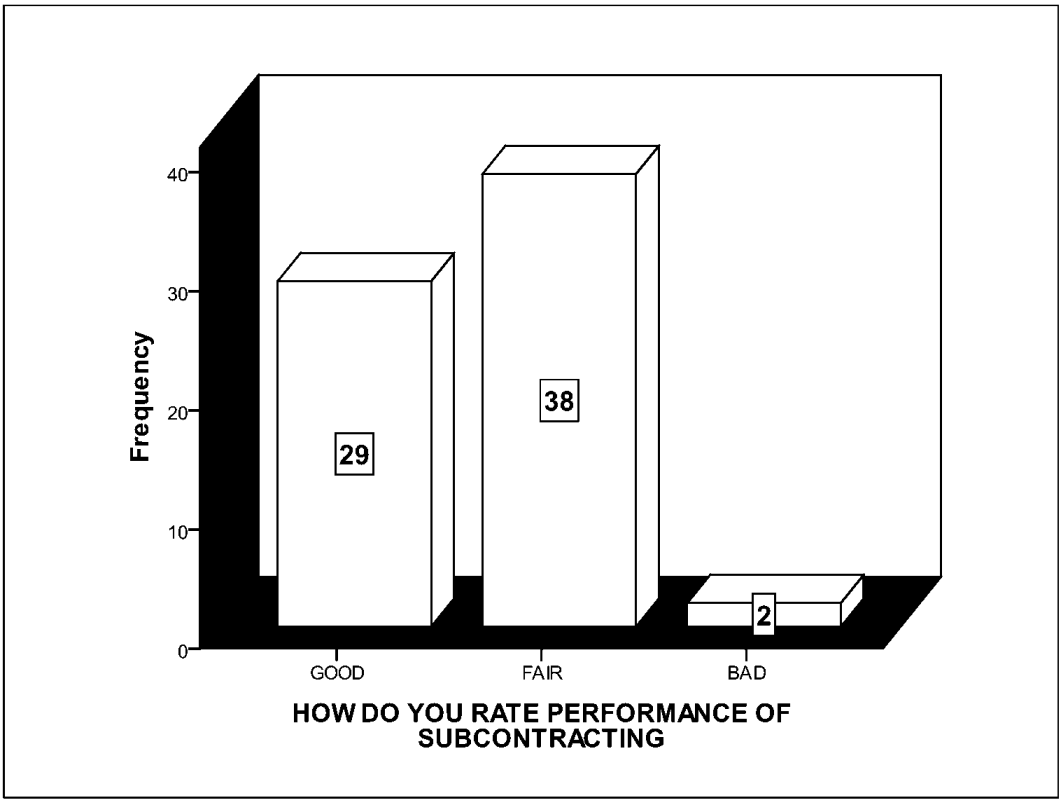

Figure 6.21: Performance of subcontractor

Q22 .How do you rate the efficiency of subcontracting or subcontractor in general?

Table 6.43: Efficiency of Subcontracting

	Performance	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Good	2	2.9	2.9	2.9
	Good	***37***	***53.6***	53.6	56.5
	Fair	***28***	***40.6***	40.6	97.1
	Bad	2	2.9	2.9	100.0
	Total	69	100.0	100.0	

Table 6.44: Kruskal Wallis Test on Efficiency

Stat	Efficiency Of Subcontracting
Chi-Square	.136
Df	2
Asymp. Sig.	***.934***

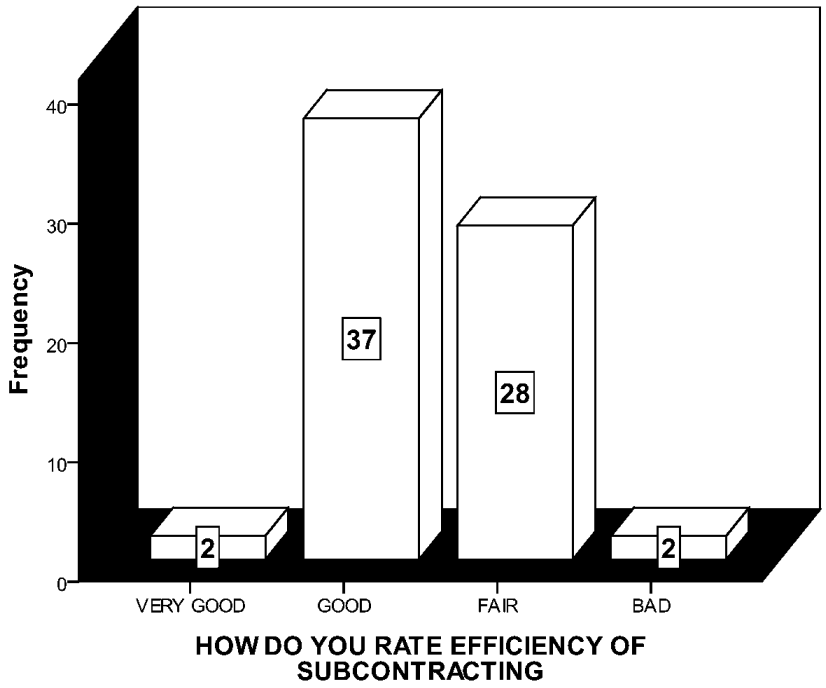

Figure 6.22: Efficiency of subcontractor

Q23 .On the whole are you satisfied with subcontracting in Pakistan construction industry?

Table 6.45: Satisfaction with Subcontract

Comments		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	***Yes***	***37***	***53.6***	53.6	53.6
	No Comments	14	20.3	20.3	73.9
	Not Satisfied	***18***	***26.1***	26.1	100.0
	Total	69	100.0	100.0	

Table 6.46: Krusk Wallis Test on Satisfaction with Subcontracting

Stat	Satisfaction with Subcontracting
Chi-square	1.304
df	2
Asymp Sig.	***.521***

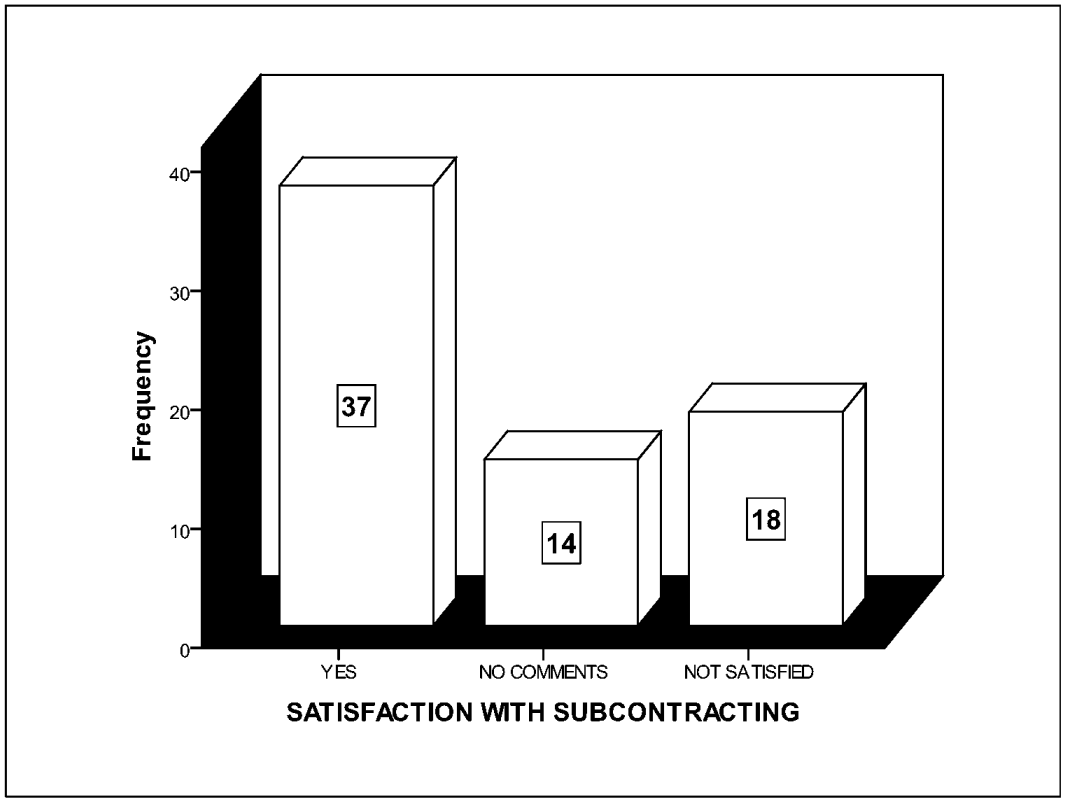

Figure 6.23: Satisfaction with subcontractor

Although 53% of the respondents showed their satisfaction on existing subcontracting system in Pakistan construction industry, but still 47% respondents want to see some positive changes in existing subcontracting arrangement.

6.3.10 Methods of improving quality

Q 24. To what extent you agree or disagree with following?

Table 6.47 :Methods for Improving Quality

Methods	N	Mean
Higher Contract Price	***69***	***1.68***
Training Of Supervisors And Foreman	***69***	***1.70***
Reducing No Of Layers By Contractor	***69***	***1.78***
Training Of Construction Workers	69	1.97
Better Designer Drawing Sets From Client	69	1.98
Set Up A Construction Industry Training Board	69	2.07
By Allowing Best Contractor In Tender	69	2.22
Client Adopt Iso 9000	69	2.43
Contractors Adopt Iso 9000	69	2.51
Longer Construction Period	69	2.59
More Import Of Skilled Labour	69	2.61
More Quality Control Engineers	69	2.62
More Foreman And Supervisors	69	2.65
Less Subcontracting	69	2.74
More Supervision From Client	69	2.80
More Direct Labour	***69***	***3.22***

Respondents showed their strong agreement on the low tender price, training of supervisory staff, reducing no of layers of subcontractors and technical training of construction worker in order of priority for the improvement of construction quality. It is also interesting to observe that application of more direct labor to improve the construction

quality got the last position in order of merit as shown in the table 6.47 above. As already discussed in the previous chapters, the application of direct labor is considered an alternate to subcontracting, which has been disregarded by all respondents unanimously. Table above shows the measures to improve quality of construction in order of priority by the ranking of their means as per respondent's opinion.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 Prospects of Subcontracting

It is evident from literature review in previous chapters that subcontracting has its pros and cons; it is no way an ideal arrangement. Moreover the thing which is most effected due to subcontracting is quality of construction. Employment of direct labor is apparently a substitute of subcontracting but it is not very pragmatic due to workload fluctuations and extremely uncertain Circumstances in Pakistan. There are various problems associated with the employment of direct labor such as heavy outlays and overheads to maintain full time staff and system and keep them motivating in the entire process. It is worth mentioning that most of the construction experts of Pakistan construction industry disregard the use of direct labor as an alternate for subcontracting.

In the present security situation in Pakistan the subcontracting will continue to thrive. The harmful effects of subcontracting will be overlooked by its positive aspects. The great amount of flexibility that subcontracting provides to the prime contractors, and its technical division of labor and cost saving facets, persist to make subcontracting striking and convenient. The Pakistani subcontracting arrangement shows that the net advantages of subcontracting could overshadow the adverse aspects of subcontracting..

This is not to say that nothing needs to be done about the present subcontracting system in Pakistan. Subcontracting practices should be permitted to persist, but it required to be more firmly managed in an endeavor to harvest the optimum benefits of subcontracting and to abolish or trim down any un-desired side-effects. In this regard, the following conclusions and recommendations are presented:-

7.2 Conclusions

a) Subcontracting in construction is the most neglected area in the research and non availability of literature on the topic in local context.

b) Wide spread use of subcontracting in Pakistan (even multi layer subcontracting being practiced).

c) Subcontracting practices are not being regulated through any regulatory authority or statuary body.

d) Intimate communication between client and contractors and immediate dissemination of decisions / requirements to the subcontractors (more pertinent to multi-layer subcontracting) is generally poor.

e) There is a pre-dominance of small subcontracting firms in Pakistan construction industry but the range of sizes of subcontracting organization is very diverse.

f) No standard form of contract exists between main contractor and subcontractor. Worst is the case between subcontractors and sub subcontractor.

g) Usually no prequalification criteria of subcontractors and sub subcontractors in Pakistan construction industry. Present system focuses on main contractor alone.

h) Subcontracting makes the application of quality management more difficult because of the additional actors involved and the resulting organizational complexities. All tiers only focus on QC and very little attention is given to QA.

i) No procedure / infrastructure exist for professional / technical grooming of subcontractors.

j) The interfaces between main contractors and subcontractors are often poorly managed, with inadequate communication and unclear division of responsibilities.

k) More than 50% of the respondents are overall satisfied with subcontracting and strongly against the use of direct labor in Pakistan construction industry..

l) The use of direct labor is not very practical because of the high degree of uncertainties and fluctuations in construction workload and higher administrative overheads.

m) The net benefits of subcontracting could far outweigh the undesirable aspects of subcontracting.

7.3 Recommendations

7.3.1 Registration, prequalification and performance evaluation

A major finding of various researches was that the registered subcontractors were perceived to perform better than non registered ones (Loh and Ofori, 2000).

The need and practicality of enforcing the registration and prequalification of subcontractors and sub subcontractors should be pursued, in order to overcome the limitations of the present system which focused on main contractors

alone. With an increasing awareness of the problems caused by inferior subcontractors, some countries maintain a centralized subcontractor registration system such as Singapore List of Trade Subcontractors (SLOTS) so as to eliminate those incompetent subcontractors from being invited from bidding for a subcontract on the basis of their performance evaluation like in Japan. It would help to identify suitable subcontractor for a particular project.

7.3.2 Need for standardization of terms of contract between contractors and subcontractors

To safeguard the subcontractor's interest it is vital that a standard form of subcontract be used in Pakistan construction industry. A number of problems can be avoided by using one of the standard forms of contract. Some contractors have their own 'look-alike' forms of contract which contain onerous provisions. The contract between a subcontractor and a lower-tier subcontractor, which is mostly a simple written contract or just an oral contract, may have undefined and unclear terms and conditions. This can lead to disputes and work suspension. So instead of prolonged negotiations between contractors and subcontractors to resolve a conflict some standard form of contract should be adopted to minimize such eventualities.

7.3.3 Number of layers of subcontracting

Unnecessary or unjustified layers of subcontracting may cause Inefficient communication, the lower-tier subcontractors may not be fully aware of the client's requirements or any work arrangement agreed between the main contractor and the top tier subcontractor, leading to substandard work or abortive work.

Superfluous elements simply acted as middlemen without any real and positive contributions, should be eliminated. Main contractors and subcontractors also need to evaluate their relative roles, duties and responsibilities, and ensure that one another's roles are essential, reinforcing, and contributory to the overall project objectives.

7.3.4 Development of infrastructure for technical grooming of the subcontractors

Both main contractors and subcontractors need to strengthen their managerial and technical capabilities. The adoption of formalized quality management systems such as the International Standards of the ISO: 9000 series should assist in overcoming these weaknesses. Besides, the training of managers and workers are also essential in order to exercise better control, achieve higher degrees of integration of activities, and meet the full technical requirements of the projects.It is recommended that government of Pakistan as well as the academic and professional

institutions should more actively assist the local construction industry to attain technical maturity which results in quality outcome..

7.3.5 Recommendations for Future Research

a) Subcontracting practices being followed by other countries and their comparison with practices being followed in Pakistan

b) Multilayer subcontracting practices in construction industry of Pakistan and their effect on construction quality

c) Evaluation of nominated subcontractor and domestic subcontractor system in Pakistan to determine future course of action

7.4 Quality Management and Subcontracting

Though most respondents 53% expressed their satisfaction over subcontracting practices in Pakistan, but as discussed above ,due to non existence of set rules and procedures many problems including substandard quality do accompany the process. In order to address the concerns of the remaining 47% of the respondents there is a need to eradicate the factors contributing to the poor quality. In this regard the government of Pakistan can play a role in lashing and facilitating the course of action, furthermore in providing the required impulsion and infrastructure.

Facing the extreme worldwide contest and the increasing expectations of employer and the community, the progression towards quality management is unavoidable. The hurdles in implementing the quality management on construction projects are well-regarded. Although it is considered as an uphill task due to involvement of an additional performer who further increases the managerial complexities. However, to meet the confronted challenges quality management is absolutely essential.

The core of quality management is to set up regimented and strict process control during every step in the construction procedure. *More rely should be on quality assurance rather than quality control* or in other words performing the task precisely at first instance rather than depending on end-product correction and modification. Due to wide spread use of subcontracting and lack of skilled labor there is dire need to have standardized quality management system for entire construction industry.

It is suggested that the Government of Pakistan as well as the professional and academic institutions should more dynamically support the local construction industry in making and *implementing a comprehensive total quality*

approach to Pakistan construction industry. Moreover the necessity and pragmatism of enforcing the *pre-qualification and registration of all tiers of subcontractors* must be pursued, in order to triumph over the limitations of the current system which focused on principal contractor alone.

Finally, for huge and multifaceted construction projects concerning numerous contractors, employers, architects etc must evaluate the *suitability of the conventional forms of contracts*. Other internationally used forms, such as FIDIC which are intended to undertake such complexities and have been effectively used in, should be taken into account for the purpose.

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APPENDIX A

- ***Covering letter***
- ***Questionnaire***

SCHOOL OF CIVIL & ENVIRONMENTAL ENGINEERING (SCEE)

SURVEY QUESTIONNAIRE

COVERING LETTER

Dear Sir,

In today's competitive business environment, subcontracting arrangements are an important practice in international and national construction projects. The subcontracting device has a considerable importance to each portion of a project because using in-house resources is costlier than outsourcing.

As the subcontracting practice is so popular while the performance of subcontractors is major factor contributing to the project success, the industry is beginning to establish whether there is a solution to enhance subcontractor performance, and the monitoring of subcontractor performance is considered as possible way to eliminate incapable subcontractors. . Even though a large portion of a construction project is usually performed by subcontractors, the issues concerning about the subcontracting practice are rarely acceptable (acknowledged) and the ways to improve subcontracting practice are seldom debated.

The undersigned intends to conduct a field survey to measure performance of subcontractors through client, consultant and contractor's feedback and to discover quality of service provided by the subcontractors on buildings and highways projects in Pakistan.

For this purpose a questionnaire (attached) have been developed. Your good self is requested to please take few minutes from your valuable time to fill this form. The information provided by your good self would be highly valued and kept confidential.

Thanks for your support and cooperation in advance.

Yours Sincerely,

MUHAMMAD ARSHAD

Post Graduate Student- Construction Engineering & Management

Cell.03009822163

Email: arshee.khurram@yahoo.com

DR. HAMZA FAROOQ GABRIEL

Thesis Advisor

National Institute of Transportation (NIT)

School of Civil & Environmental Engineering (SCEE)

NUST, Islamabad.

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY (NUST)
DEPARTMENT OF CONSTRUCTION ENGINEERING AND MANAGEMENT
A SURVEY OF SUBCONTRACTING PRACTICES
IN THE PAKISTAN CONSTRUCTION

EXPLANATORY NOTES

1. Thank you for completing this questionnaire.
2. Please tick the appropriate boxes and add any remarks as you consider relevant.
3. If more than one answer applies, please rank them numerically in decreasing order of importance (with 1=most important and so on).

General Information (Will Not be Published)

Name	
Experience in Construction Industry (Years)	
Organization / Department / Firm / Company(Public/private/PEC category)	
Appointment / Designation / Rank	
Category	Client / Consultant / Contractor

SECTION ,1 - COMPANY BACKGROUND INFORMATION

1. What are the PRINCIPAL activities of your company?

Building Construction [ ] Piling [ ]
Civil Engineering [ ] Specialist Services [ ]

Others (Please specify) _____ [ ]

2. How many FULL-TIME employees are there in your company?

Managerial / Professional Staff

Foremen / Supervisors

Construction Workers

3. HOW LONG have your company been established in PAKISTAN?

_____ years

SECTION 2 : EXTENT AND INVOLVEMENT IN SUBCONTRACTING

4. From your experience, how OFTEN is sub-contracting used in construction in PAKISTAN ?

[ ] Always [ ] Mostly [ ] Sometimes [ ] Occasionally [ ] Never

_____

_____

_____

5. Over the last THREE years,

(a) HOW MANY construction contracts have your company undertaken?

(b) In HOW MANY of those contracts were you the MAIN CONTRACTOR?

(c) In HOW MANY of those contracts were you the SUB-CONTRACTOR?

6. Which of the following RESOURCES does the SUB-CONTRACTOR provide?

LABOUR	[ ] Always	[ ] Mostly	[ ] Sometimes	[ ] Occasionally	[ ]	Never
PLANTS	[ ] Always	[ ] Mostly	[ ] Sometimes	[ ] Occasionally	[ ]	Never
MATERIALS	[ ] Always	[ ] Mostly	[ ] Sometimes	[ ] Occasionally	[ ]	Never

SECTION 3 - REASONS FOR SUBCONTRACTING

7. When you were the MAIN CONTRACTOR, why did you offer a sub-contract ?	Degree of Importance (1=most important, 4=least,5=unimportant)				
It is traditional to do so	1	2	3	4	5
Unable to undertake the work itself because specialist skills or equipment are required	1	2	3	4	5
Able, but outside my capacity	1	2	3	4	5
To reduce costs	1	2	3	4	5
To reduce risks	1	2	3	4	5
To save time	1	2	3	4	5
To absorb fluctuations in workload	1	2	3	4	5
To maintain Long-term relationship with subcontractor	1	2	3	4	5
Tax advantages or tax evasion	1	2	3	4	5
Others reasons (Please specify)	1	2	3	4	5

8.On the other hand, when you were the SUB-CONTRACTOR, why did you undertake a SUB-CONTRACT ?	Degree of Importance (1=most important, 4=least,5=unimportant)				
To increase profits	1	2	3	4	5
To reduce losses	1	2	3	4	5
To increase volume of business or to maintain a a sufficient workload for its men or machinery	1	2	3	4	5
To establish or maintain a long-term relationships with the Main Contractor	1	2	3	4	5
Other reasons (Please specify)	1	2	3	4	5

10. On what BASIS does a main contractor CHOOSE a sub-contractor ?	Degree of Importance (1=most important, 4=least,5=unimportant)

	1	2	3	4	5
Price	1	2	3	4	5
Quality	1	2	3	4	5
Ability to complete the work on time	1	2	3	4	5
Sub-contractor's resources (labour,plants or materials)	1	2	3	4	5
Personal Relationships	1	2	3	4	5
Others (Please specify)					

11. HOW does a Main Contractor CHOOSE a Subcontractor ?	Degree of Importance (1=most important, 4=least,5=unimportant)				
	1	2	3	4	5
Open-bidding from all interested parties	1	2	3	4	5
Invite bids from a selected list	1	2	3	4	5
Direct one-to-one negotiation	1	2	3	4	5
Other methods (Please specify)					

SECTION 5 - FORM AND TERMS OF THE SUBCONTRACTS

12. What is the FORM of the subcontract normally used ?

	Between Main-Contractor and Subcontractor	Between Sub-Contractor and Sub-Contractor
WRITTEN - Formal and detailed	[ ]	[ ]
WRITTEN - But not very detailed	[ ]	[ ]
VERBAL only - No formal contract document	[ ]	[ ]
UNKNOWN	[ ]	[ ]

13. How is the TERMS of the subcontracts determined ?

Based on the bid submitted by the subcontractor	[ ]
Determined unilaterally by the Main Contractor	[ ]
Ditto, but the rates are reduced to cover for the Main Contractor's profits or project management charges	[ ]
Based on direct negotiation between the parties	[ ]
Other methods (Please specify)	[ ]

14. What is the duration of your current or most recent sub-contract? _____ months

SECTION 6- PROBLEMS AND REMEDIES FOR SUBCONTRACTING

16.HOW OFTEN does problems arise because of subcontracting ?

[ ] Always [ ] Mostly [ ] Sometimes [ ] occasionally [ ] Never

17. What are the MAIN problem areas ?	Degree of Importance (1=most important, 4=least,5=unimportant)				
Quality of work	1	2	3	4	5
Progress	1	2	3	4	5
Lack of cooperation	1	2	3	4	5
Excessive material wastage	1	2	3	4	5
Difficult to control or co-ordinate activities	1	2	3	4	5
Others (Please specify)	1	2	3	4	5

18. How are the problems usually RESOLVED ?

Prolonged negotiation [ ]

Arbitration or Mediation or Through a Third Party Legal Action [ ]

Subcontractor simply abandoned the job and disappeared [ ]

Other methods (Please specify) [ ]

SECTION 7 – USE OF SUB-SUB-CONTRACTING

19. HOW OFTEN is sub-sub-contrac

[ ] Always [ ] Mostly [ ] Sometimes [ ] Occasionally [ ] Never

20.how much control does the main contractor have over the following:	Degree of Importance (1=most important, 4=least,5=unimportant
Choice of sub- sub- contractor	1 2 3 4 5
Quality of works executed by sub-contractor and sub sub- contractor	1 2 3 4 5
TIME OF COMPLETION OF WORK BY SUB-CONTRACTORS	1 2 3 4 5

SECTION 8 - PERFORMANCE AND SATISFACTION WITH SUB-CONTRACTING

21.How do you rate the PERFORMANCE of subcontracting or subcontractors in general ?

[ ] Very Good [ ] Good [ ] Fair [ ] Bad [ ] Very Bad

[

22.How do you rate the EFFICIENCY of subcontracting or subcontractors in general ?

[ ] Very Good [ ] Good [ ] Fair [ ] Bad [ ] Very Bad

23.On the whole, are you SATISFIED with subcontracting in the PAKISTAN construction industry?] Yes [ ] No comment [ ]

SECTION 9-METHODS OF IMPROVING QUALITY OF CONSTRUCTION

24. To what extent do you AGREE or DISAGREE with the followings ?	AGREE		NEUTRAL		DISAGREE
	SA	A	N	D	SD
	(SA=Strongly Agree,A=Agree,N=Neutral, D=Disagree,SD=Strongly Disagree, etc.)				
Contract Price should be higher	1	2	3	4	5
Construction period should be longer		2			
Client should reduce competition by allowing only the best performing contractors to tender		2			
Better design, drawings, documents, and better cooperation from client	1	2			
Main Contractor should use more direct labour instead of sub-contracting		2			
Main Contractor should restrict the extent and no. of layers of sub-contracting		2			
Training of supervisors and foremen		2			
Training of construction workers		2			
Main Contractor should employ more quality control engineers etc.		2			
Main Contractor should employ more foremen and supervisors		2			
Contractors and sub-contractors should develop a formalised quality management system (e.g. ISO:9000)	1	2			
Clients should adopt a formalised quality management system		2			
Clients should increase the level of site supervision		2			
Government should allow more import of skilled labour		2			
Government should set up a construction industry training board and assist in training of workers and foremen and supervisors		2			

25. For further comments/ remarks, please specify below:

APPENDIX B

- *CODING OF VARIABLES*

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 1	**COMPANY BACKGROUND INFORMATION**		
Q1	PRINCIPAL ACTIVITIES OF CONSTRUCTION		
Q1	Principal Activites	CEM.VAR 1	1== Building Construction,2= Piling,3= Civil Engineering,4= Specialist Services,5= Others
Q2	COMPANY SIZE		
Q2a	No. of Full-Time Managers / Professionals	CEM.VAR2	
Q2b	No. of Full-Time Foremen / Supervisors	CEM.VAR3	
Q2c	No. of Full-Time Construction Workers	CEM.VAR4	
Q2d	Total of Q2a+Q2b+Q2c	CEM.VAR 5	(Remarks : Q2d = Q2a + Q2b +Q2c)
Q3	COMPANY AGE (in years)	CEM.VAR6	

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 2	**EXTENT AND INVOLVEMENT IN SUBCONTRACTING**		
Q4	FREQUENCY OF SUBCONTRACTING	CEM.VAR 7	1=Always, 2= Mostly, 3=Sometimes, 4=Occasionally ,5=Never
Q5	NUMBER & TYPES OF CONTRACTS UNDERTAKEN		
Q5a	No. of Contracts undertaken over last 3 years	CEMVAR 8	
Q5b	No. of Main Contracts over last 3 years	CEM.VAR 9	
Q5c	No. of Sub-Contracts over last 3 years	CEMVAR 10	
Q6	RESOURCES PROVIDED BY SUBCONTRACTOR		
Q6a	Labor provided by Sub-Contractor	CEM.VAR 11	1=Always, 2= Mostly, 3=Sometimes, 4=Occasionally ,5=Never
Q6b	Plants provided by Sub-Contractor	CEMVAR 12	1=Always, 2= Mostly, 3=Sometimes, 4=Occasionally ,5=Never
Q6c	Materials provided by Sub-Contractor	CEM.VAR 13	1=Always, 2= Mostly, 3=Sometimes, 4=Occasionally ,5=Never

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES
IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 3	REASONS FOR SUBCONTRACTING		
Q7	MAIN CONTRACTORS' REASONS		
Q7a	Follow the Tradition	CEM.VAR14	1=Most important,2=Important,3=Less important 4=Least mportant 5=Unimportant
Q7b	Unable to undertake work	CEM.VAR	1=Most important,2=Important,3=Less important
Q7c	Outside Capacity	CEM.VAR 16	1=Most important,2=Important,3=Less important
Q7d	To reduce Costs	CEM.VAR 17	1=Most important,2=Important,3=Less important
Q7e	To reduce Risks	CEM.VAR 18	1=Most important,2=Important,3=Less important
Q7f	To save Time	CEM.VAR19	1=Most important,2=Important,3=Less important 4=Least mportant,5=Unimportant
Q7g	To absorb Fluctuations	CEM.VAR20	1=Most important,2=Important,3=Less important

APPENDIX B

STUDY OF SUBCONTRACTING PRACTICES

IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
Q7h	To maintain Relationships with Sub-Contractor	CEM.VAR21	1=Most important,2=Important,3=Less important
Q7i	Tax advantage or evasion	CEM.VAR 22	1=Most important,2=Important,3=Less important 4=Least mportant,5=Unimportant
Q7j	Other reasons	CEM.VAR23	1=Most important,2=Important,3=Less important
Q8	SUBCONTRACTORS' REASONS		
Q 8 a	To increase Profits	CEM.VAR 24	1=Most important,2=Important,3=Less important
Q 8 b	To reduce Losses	CEM.VAR25	1=Most important,2=Important,3=Less important
Q 8 c	To increase Volume	CEM.VAR26	1=Most important,2=Important,3=Less important
Q 8 d	To maintain Relationships	CEM.VAR 27	1=Most important,2=Important,3=Less important
Q 8 e	Other reasons	CEM.VAR 28	1=Most important,2=Important,3=Less important 4=Least mportant,5=Unimportant

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 4	CHOICE OF SUBCONTRACTOR		
Q9	KEEP LIST OF SUBCONTRACTOR	CEM.VAR	1=Yes, 2=No
Q10	LIST OF SUBCONTRACTORS		
Q10a	No. of Sub-Contractor on List	CEM.VAR30	
Q10b	Review List of Sub-Contractors	CEM.VAR	1=Yes, 2=No
Q11	MAIN CONTRACTORS' BASIS FOR		
Q11a	Price	CEM.VAR 32	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Ql1b	Quality	CEM.VAR 33	1=Most important,2=Important,3=Less important 4=Least important,5=Unimportant
Q11c	Ability to complete the work on time	CEM.VAR 34	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Q11d	Subcontractor's Resources	CEM.VAR	1=Most important,2=Important,3=Less important 4=Least
Q11e	Personal Relationships	CEM.VAR	1=Most important,2=Important,3=Less important 4=Least
Q11f	Others	CEM.VAR	1=Most important,2=Important,3=Less important 4=Least

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES
IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
Q12	METHOD OF CHOOSING		
Q12a	Open-bidding	CEM.VAR 38	1=Most important,2=Important,3=Less important 4=Least
Q12b	Select & Invite bids	CEM.VAR 39	1=Most important,2=Important,3=Less important 4=Least
Q12c	One-to-One Negotiation	CEM.VAR 40	1=Most important,2=Important,3=Less important 4=Least
Q12d	Other methods	CEM.VAR 41	1=Most important,2=Important,3=Less important 4=Least
SEC	**FORMS AND TERMS OF**		
Q13	FORM OF SUBCONTRACTS		
Q13a	Between Main & Sub-Contractor	CEM.VAR 42	1=Written(detailed), 2=Written(not very detailed), 3=Verbal only
Q13b	Between Sub & Sub-Sub-Contractor	CEM.VAR 43	1=Written(detailed), 2=Written(not very detailed), 3=Verbal only
Q14	DETERMINATION OF SUBCONTRACT		
Q14a	Based on Bid by Sub-Contractor	CEM.VAR 44	1=Yes
Q14b	Determined unilaterally by Main-Contractor	CEM.VAR 45	1=Yes
Q14c	Same terms as Main Contract	CEM.VAR 46	1=Yes
Q14d	Modified from Main Contract	CEM.VAR 47	1=Yes
Q14e	Based on Direct Negotiation	CEM.VAR 48	1=Yes
Q14f	Other methods	CEM.VAR 49	1=Yes
Q15	DURATION OF SUB-CONTRACT	CEM.VAR 50	

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 6	**PROBLEMS AND REMEDIES FOR**		
Q16	FREQUENCY OF PROBLEMS DUE TO SUBCONTRACTING	CEM.VAR 51	1=Always, 2= Mostly, 3=Sometimes, 4=Occasionally ,5=Never
Q17	MAIN PROBLEM AREAS		
Q17a	Quality	CEM.VAR52	1=Most important,2=Important,3=Less important 4=Least
Q17b	Progress	CEM.VAR 53	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Q17c	Lack of Cooperation	CEM.VAR 54	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Q17d	Excessive Material Wastage	CEM.VAR 55	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Q17e	Difficult to Control or Cordinate Activities	CEM.VAR 56	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Q17f	Other problems	CEM.VAR 57	1=Most important,2=Important,3=Less important 4=Least important 5=Unimportant
Q18	METHODS OF RESOLVING PROBLEMS		
Q18 a	Prolonged Negotiation	CEM.VAR58	1=Yes
Q18 b	Arbitration or Mediation or Through Third	CEM.VAR	1=Yes
Q18 c	Legal Action	CEM.VAR	1=Yes
Q18 d	Subcontractor simply Abandons the Job	CEM.VAR61	1=Yes
Q18 e	Other methods	CEM.VAR	1=Yes

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 7	**USE OF SUB-SUB-CONTRACTING**		
Q19	FREQUENCY OF SUB-SUB-CONTRACTING	CEM.VAR 63	1=Always, 2= Mostly, 3=Sometimes, 4=Occasionally,5=Never
Q20	DEGREE OF MAIN CONTRACTORS'		
Q20a	Control over Choice of Sub-Sub-Contractors	CEM.VAR64	1=Most important,2=Important,3=Less important 4=Least
Q20b	Control over Quality of Works	CEM VAR	1=Most important,2=Important,3=Less important 4=Least
Q20c	Control over Completion Time of Activities	CEM.VAR 66	1=Most important,2=Important,3=Less important 4=Least mportant,5=Unimportant
SECTION 8	**PERFORMANCE AND SATISFACTION WITH SUBCONTRACTING**		
Q21	PERFORMANCE OF SUBCONTRACTORS	CEM.VAR67	1=Very Good, 2=Good, 3= Fair, 4= Bad, 5=Very Bad
Q22	EFFICIENCY OF SUBCONTRACTING	CEM.VAR 68	1=Very Good, 2= Good, 3= Fair, 4= Bad, 5=Very Bad
Q23	SATISFACTION WITH SUBCONTRACTING	CEM.VAR	1=Yes, 2=No comment, 3= No

APPENDIX B

A STUDY OF SUBCONTRACTING PRACTICES IN THE PAKISTAN CONSTRUCTION INDUSTRY

REF	DESCRIPTION	VAR. NO.	CODING FOR ANSWERS
SECTION 9	**METHODS OF IMPROVING QUALITY OF CONSTRUCTION**		
Q24	METHODS OF IMPROVING CONSTRUCTION		
Q24 a	Higher Contract Price	CEM.VAR 70	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24 b	Longer Construction Period	CEM.VAR 71	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24c	Less Competition	CEM.VAR 72	1 = Strongly Agree, 3= Neutral, 5= Strongly Disagree
Q24 d	Better Designs, Drawings, etc. from Client	CEM.VAR 73	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24e	More Direct Labor	CEM.VAR 74	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24f	Less Subcontracting	CEM.VAR 75	1 = Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24 g	Training of Supervisors and Foremen	CEM.VAR 76	1= Strongly Agree, 3= Neutral, 5= Strongly Disagree
Q24 h	Training of Construction Workers	CEM.VAR77	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24i	More Quality Control Engineers	CEM.VAR78	1= Strongly Agree, 3= Neutral, 5= Strongly Disagree
Q24 j	More Foremen and Supervisors	CEM.VAR 79	1 = Strongly Agree, 3= Neutral, 5= Strongly Disagree
Q24k	Contractors adopt ISO:9000	CEM.VAR 80	1 = Strongly Agree, 3= Neutral, 5= Strongly Disagree
Q241	Clients adopt ISO:9000	CEM.VAR 81	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q24 m	More supervision from Client	CEM.VAR 82	1= Strongly Agree, 3= Neutral, 5= Strongly Disagree
Q24 n	More Import of skilled labor	CEM.VAR 83	1= Strongly Agree, 3=Neutral, 5= Strongly Disagree
Q240	Set up a Construction Industry Training Board	CEM.VAR 84	1= Strongly Agree, 3 =Neutral, 5= Strongly Disagree
Q25	CONCLUDING REMARKS ON SUBCONTRACTING	CEM.VAR 85	

APPENDIX C

- ***DATA IN SPSS***