# CONSTRUCTION CLAIMS IN SAUDI ARABIA
# A STUDY OF SOURCES AND ASSOCIATIONS OF CLAIMS

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# Abstract

The construction industry is a complex one involving the participation of several parties, each with its own aims from getting into a project. The difference in these aims is one basic factor leading to conflicts and claims. Ownership of projects is split between government (public) and private entities and the size of projects in terms of cost could be categorized between small, medium and large. The Saudi construction industry is relatively young, and research on the local environment and problems is far from being extensive. This thesis will discuss the issue of construction claims in the Saudi construction industry with the aim of identifying the major heads of claims in the country. A literature review was made and the dependent and independent variables affecting the claim issue were identified. The dependent variables were ***Time, Money, Quality, Operation, Function, Life Expectancy, Reputation and Future Relations.*** The independent variables were: Party to a project (owner, contractor and consultant) Project Ownership (government, private) and Size of a project (small, medium or large). From the literature review and from experience the claim causes were grouped under six claim groups: 'Acts of God', 'Man-made', 'Market-Driven', 'Site Conditions', 'Contract Administration-based' and 'Information-based' claims. A research methodology was formulated to gather the necessary data by a postal questionnaire. Responses were classified in three major categories; party to the project responding to the questionnaire (owner, contractor or consultant) ownership of the project (government or private) and size of the project (small, medium or large). Six hypotheses were formulated and the data was analysed to get results and test the hypotheses. The results were discussed and they showed that the Information-based group of claims had the strongest association with the sample followed by the

'Contract Administration' group. The highest weight of association of claims in the 'Information-based' group were by the claims on poor skills by contractor, defected work by contractor and poor management by contractor. In this group the Money factor was the most highly associated followed by the Time factor. The highest weight of association of claims in the 'Contract Administration' group were by the claims on delayed payments by owner, variation order timing and the claim on too many variation orders. In this group, the ***Time*** factor was the most highest associated of the eight variables followed by the ***Money*** factor. This research on Saudi Arabia identifies the source of claims based on the perception of a hundred respondents to the questionnaire. A summary of the findings was made together with what contribution this thesis has made to new knowledge. A section on future work was also included.

## Chapter 1

### Overall Research Philosophy

This research will start with a chapter on an overview of the Saudi general environment with some emphasis on the construction environment. The overview will cover such issues as the legal framework in the country, the economic and political environments and will shed some light on some issues of the construction industry such as manpower, turnover and competition. A chapter on the literature review will follow, showing what a claim is in construction and the phases it will pass through from initiation and party initiating, to other phases uptill the settlement of the claim. Chapter (3) will discus the research methodology used in this thesis, discussing the comparison between quantitative and qualitative approaches. There will be a discussion on the validity, reliability and generalisability of the research methodology and a discussion of the questionnaire design, data collection and the pilot study. The limitation to the study will also be discussed here. The following three chapters will discuss the association of claims with the dependent variables coming out of the literature review, by the different groups of claims regarding the ownership of a project, size of a project and party of a project. Chapters (4, 5 and 6) discuss the association relationships between the factors (dependent and independent). Chapter (7) will discuss the acceptance or rejection of the general hypotheses that were formulated earlier in chapter (3). The party to the project (owner, consultant and contractor) will be discussed to show whether any of them will have any association with a certain claim. The ownership of a project (government or private) is also discussed to show what certain claims are associated with any of them, and what claims are associated with any particular size of a project (small, medium or large). All three independent variables mentioned above (party,

ownership and size) will also be discussed and whether there is any association of claims arising from them with the eight dependent variables outlined in this research (time, money, quality, function, life expectancy, operation, reputation and future relation of the parties). The final chapter (8) will discuss the findings of this research, with a paragraph on revisiting the research model and another on future research needs.

## Saudi General Environment

### Introduction

The construction industry in Saudi Arabia is relatively young and heavily dependent on foreign labour. A construction boom in the mid seventies discovered that the industry was not robust enough and left hundreds of contractors out of business and hundreds others in court trying to regain whatever they lost during the boom years. The legal system was not fully prepared for this influx of disputes and even the parties to the projects were not up to the necessary standard in either claiming or even defending their position in court. Alternative dispute resolution techniques were almost unheard of in construction and there was no national construction law. Claims were looked at as an evil, thus any contractor would try to avoid them, and claims management was not heard of at that time. Nowadays things are improving and the parties to projects are increasingly aware of the negative impact of conflicts, disputes and claims on the progress on site, and are keen to resolve them on time. The aim of this research is to identify the major heads of claims in the Saudi construction industry in the government and private sectors, identify the role of the major parties to a project in claims management, and to find any noticeable differences of claims regarding the size of projects. Variables that will be associated by claims and the magnitude of this association are

another aim of this research which starts by giving an overview of the Saudi construction industry, and that necessitates giving a glimpse of the legal framework in the country together with the political and economical environments. A literature review will follow to shed light on the claim management progress followed by a chapter on the methodology of this research and six hypotheses were drawn. Claims in this thesis were grouped into six groups and eight variables were deducted from the literature review. The association of the claim groups with these variables was discussed in several chapters and the hypothesis tested. A final discussion shows the findings of this research.

## 1.1) Legal Framework

### 1.1.1) Sources Of Law

#### i. Islamic Law

The Hanbali School of Islamic Jurisprudence is the main source of law in Saudi Arabia (article 6 of the Saudi Arabian constitutional instrument/1926). This school gives significance to the traditions and sayings of the prophet Mohammed (peace be upon him), and was founded by the imam Ahmed Ibn Hanbal (780-855AD) and gained fewer supporters than the other schools. Its thoughts were revived in the eighteenth century by Sheikh Mohammed Ibn Abdulwahhab in central Arabia, who founded and led the Wahabi movement throughout Arabia. After the state of Saudi Arabia was proclaimed in 1920, the Supreme Judicial Council passed a resolution in 1926 making it mandatory for courts to rely on Hanbali texts. The bulk of the law in Saudi Arabia is still to be found in the traditional sources of the Islamic law and the scholarly writings of old masters of Hanbali jurisprudence. M.I. Ahmad Ali & A.W.Abusulaiman (1969) maintain that the judicial developments in Saudi Arabia are proof of the fact that the Hanbali School of law, having

left the door of reasoning (Ijtihad) open, enables the contemporary judges and legal authorities to adopt any appropriate solutions they think fit, so long it does not run contrary to the main Islamic principles.

**ii. State Regulations**

The second source of law in Saudi Arabia is the state regulation. In Islam the law giver is God (Allah), thus legislative enactments are not called legislation, but are rather labeled "state regulations". S.H. Amen (1985) comments that the difference in terminology has no practical significance. The regulations have the same force, authority, weight and sanctions as any appropriate legislation would have in any other jurisdiction. Amin adds that those state regulations are not aimed to detract from the Islamic law traditions or change and reform, but simply to supplement them.

**iii. Custom And Practice**

Amin (1985) states that modern commercial practice and international trade have contributed significantly to the development of the contemporary Saudi legal system. He thinks that western lawyers negotiating contracts on behalf of their clients have introduced to the Saudi legal environment some legal terminology and alien legal concepts. He thinks that the local business law faces a constant conflict between its indigenous roots and the imported legal concepts. These conflicts have to be resolved by the Saudi courts and the Saudi administration too.

### 1.1.2) Development of the National Legal System.

The traditional sphere of law is governed by Shariah, while the new aspects of law (such as corporation, tax, oil and immigration laws) are subject to the provisions contained in the royal decrees. Legal reforms in

1927, 1931, 1936, and 1952 were the basis for the legal development in the kingdom. The judicial council was established by the late king Faisal to reconcile any conflict between the present-day socio-economic requirements and the Islamic traditions. Regulations for the commercial court in 1931 were borrowed from the Egyptian commercial code (which in turn was based on the Ottoman code), the companies' law of 1965 was also based on the Egyptian and European codes Amin.(1985). Humphries (1979) suggested that the Royal Decrees issued by the King aim at achieving an acceptable balance between the traditional Islamic and moral concepts on one hand and the needs and requirements of the modern Saudi Arabia on the other. The state has promulgated such laws as the law on founding the Board of Grievances (1955), the Company's Law (1956 amended 1978), the Labour and Workers' Law (1969), the Social Insurance Law (1970) and the Arbitration Law (1983). There has been a considerable growth in royal decrees and a tendency to codify the areas of business law in general and laws dealing with the investment and foreign trade. These new codes and decrees are consistent with the Islamic legal principles, and in case of conflict the Sharia would prevail over royal decrees.

**i. The Judiciary:**

There are two systems working in parallel for dispute resolution in Saudi Arabia; there is a hierarchy of Shariah courts with general jurisdiction and there are other specialized judicial tribunals disposing of the special issues.

**ii. Shariah courts:**

These are organized by the Ministry Of Justice. Appeals above

these courts are provided by these bodies:

a) The Court Of First Instance consisting of two categories:

1) Lower courts that deal with minor claims
2) General courts having general jurisdiction over all civil and criminal cases.

b) Courts of Appeal: the two existing courts in Riyadh and Mecca hear appeals from lower courts. Their decisions are final except in sentences of death, stoning or amputation.

c) Supreme Judicial Council ,with administrative consultative and judicial functions.

**iii. Administrative Tribunals:**

These are specialized tribunals which have been established to arbitrate any complaints arising out of a prescribed situation. The most important of these tribunals is the (Board of Grievances) "Diwan Al-Mazalim ". It was constituted by the Royal Decree no. m/51 (1982) as an independent judicial authority to adjudicate all disputes between the Government and third parties, except for acts connected with the sovereignty of the state. The" Commission for Settlement of Commercial Disputes" was founded to handle those disputes arising from the application of the Companies' Law. It was set up under the terms of article 232 of the Companies' Law. Russel's (1975) opinion is that this law is in some ways more modern and appropriate to the business life than that of the United Kingdom. This court was disbanded and its powers were moved to Commercial Circles in the Board of Grievances. The Regulation for the Investment of Foreign Capital set up a committee to review application for investment by foreign nationals and companies

in Saudi Arabia. The Committee for Settlement of Labour Disputes set up in 1969 was entrusted with reviewing all disputes pertaining to labour accidents of whatever amount.

**iv. Arbitration:**

The Royal Decree no. 32 dated 15 Moharram 1350H, regulated the arbitration of commercial disputes until the "Regulations on Arbitration" were issued by the Royal Decree on April 25, 1983 , and published in the official gazette (Umm Alqura) on 22 - 8 -1403H (3June 1983).

**1.1.3) Legal Education**:

The training of judges takes place through the Shariah institutes of learning and a three year course of judicial training at the Higher Judicial Institute. Advocates are either graduates of Shariah institutes or from the newly founded law school which first awarded its degrees in 1990.

**1.2 ) Economic Environment**:

Saudi Arabia has a substantial wealth based on its oil revenues. It has strong financial reserves (estimated in 1984 to be around US $ 130 Billion). Saudi Arabia has a 40% control over the world's oil imports excluding the ex - communist block), and its oil wealth is almost a quarter of the world's total known reserves. Its production ranged from 8.5 million barrels a day in the mid 1970s to 3 million barrels a day in 1983 when the demand for oil was declining. In 1992 its production was an average of 5 million barrels a day, and rose to over 8 million in the early 2000s. In an effort to reduce its dependency on oil exports, Saudi Arabia undertook many giant petrochemical projects by the state owned Petroleum and Mineral Organization (Pertomin) and its subsidiary the Saudi Marketing and Refinery Company (Samarec). Saudi Basic

Industries Corporation (Sabic) the mainly state owned industrial conglomerate also had a giant share in this program. Two new cities were specially built to accommodate the new industries: Yanbou on the western coast overlooking the Red Sea, and Jubail on the eastern coast overlooking the Arabian Gulf are the most modern of Saudi cities and are to grow up to their final capacities in the early Twenty First century. A series of five-year plans started in 1970. The second five-year plan commencing in 1975 had a total expenditure budget of $150 billion. These first two plans aimed to build the infrastructure and to transfer Saudi Arabia into a modern state. The Saudi Industrial Development Fund (SIDF) encourages investing in the industry by offering up to 50% of a project's capital as an interest-free loan, plus some tax incentives. The National Industrialization Company (NIC), partially owned by the state was also set up to stimulate the private sector's involvement in the industrial investments. (NIC) will provide 30-40% of the needed capital for the major industrial projects. The construction industry got the greatest attention in the second (1975-1980) and the third (1980 – 1985) five years plans, with infrastructure projects majoring 50% and 30% respectively of the two plans budgets. Construction in the fourth (1985-90) five year-plan totaled US$ (30) Billion, and an estimated US $ 29 Billion in the fifth (1990 - 1995) plan.

### 1.2.1) Accomplishment of the 4th five-year plan (1985-1990)

- the Saudi construction sector participated a 15.5% of the gross national product in 1990.
- an 8.2 annual decrease in activity was maintained below the planned 2.8% throughout the plan

- 69 %of the planned number of the housing units was accomplished.
- 3477 new prequalification certificates were issued to local and foreign contractors, and 927 contractors were requalified
- only 58% of the planned number of housing units were financed by the government's Realestate Development Fund.
- local contractors increased their stake government projects from 67% to 85%.
- 60.5 % of the housing plan was accomplished.

### 1.2.2) Fifth five-year plan (1990 – 1995)

The plan specified 10.2 billion US Dollars as added value in 1995 in the construction sector with an average annual growth of 3.8%. This sector's value was estimated at 12.4 billion US Dollars almost 16% of the entire non-oil sector's output and 12.3% of the gross national product (GNP). The government's civil expenditure on housing and municipalities was estimated at 11.9 billion US Dollars, equivalent to almost 9% of the total civil expenditure, a 37.4% increase over the fourth plan. Capital investment in 1995 was estimated at 930 million US Dollars, a 59% increase over the 1990 figure. Expected manpower participation in the construction industry in 1995 was estimated at 959,900 with an average annual increase of 0.3 % over the 1990 count. Engineers will total 78,600 by 1995, an increase of 12% over the 1990 number, and technicians will total 65,500 with an increase of 12 % over the 1990 number. With the influx of Saudi manpower to the job market, the plan provides for the replacement of 220,400 foreign labourers by the Saudi nationals in all fields of services and industries. Saudi nationals accounted for a modest 5% of manpower in the construction industry till 1990. There will be an estimated 65,200 jobs in demand in the construction industry and related

fields; while there will be an estimated supply of 78,600 Saudi manpower, with an increase in supply of 11,400 jobseekers, which will necessitate the above mentioned replacement.

Main objectives of the construction sector in the fifth five-year plan were

1) reactivating this sector with the intention of increasing its participation in the national income.
2) upgrading of the sector's performance to increase production factor's return, by improving rules and legislation and upgrading of bodies supervising the industry.
3) increase of participation by Saudi contractors and consultants in all projects specified in the plan.
4) complete use of all local manufactured materials and products in government projects, with the aim of encouraging local industries.

The Saudi construction market has attracted construction companies from all four corners of the globe with US and Korean companies as the forerunners. British and Japanese companies came next, and almost every European country had a stake in that boom. Saudi law asks that the foreign companies and joint ventures have Saudis in their payroll representing 51%. Russell (1975) argues that local labour is in short supply and wage rates are higher than elsewhere in the Middle East. Companies entering into contract with the government should insure with the state owned Cooperative Insurance Company. Entering in contract with the private sector, companies should insure with one of the local insurance companies.

## 1.3) Political Environment

Saudi Arabia is a monarchy and a theocracy. The King, who is the head of the house of Saud the ruling family, is both king and (Imam), religious leader. The King acts with the advice of a Consultative Council and the (Ulama), the body of religious dignitaries, who interpret the Sharia. The Consultative Council was made up of members of the royal family, the Ulama, heads of important tribes, and the others whose advice the King values. A Royal Decree in March 1992 dissolved the old Consultative Council and provided for a new modern one. The speaker of the council was nominated but no members yet chosen for the office. Later a body of over a hundred members was nominated. There is a Council of Ministries, of whom there are several members of the royal family heading the more important ministries. The council is headed by the Prime Minister who is the King himself. Several noble families are either represented in the Council of Ministries or represented through one or more individuals as regional governors. The kingdom is divided into twelve provinces. A regional governor or (Amir), appointed by the king rules over each province, and governors are also appointed to the more important towns. Saudi Arabia enjoys relatively relaxed political relations with its neighbours; old boundary conflicts are being gradually settled. The Kingdom is not a member of any political regional treaty, yet together with other Gulf States, it formed the Gulf Co-operation Council (GCC), an economic federation aimed at strengthening the collective member's economic status. The Kingdom is a member of the United Nations Organisation, the Arab League, the organisation of the Islamic Conference, the Moslem World League, and is the seat of the latter two. The country emerged as a regional political power following its economic

boom in the late seventies through capitalising on its oil resources. Saudi Arabia was a founding member of OPEC, the oil producing countries organisation. The foreign policy was directed against communism and not until the fall of that ideology did the Kingdom start any diplomatic and economic relations with the members of the previous eastern block. Foreign aid to poor neighbours and other distant countries strengthened the country's regional leadership. An old and continuing strong contact with Moslem countries and communities world wide is the pilgrimage (Haj) to Macca which gives the country a special status in the Moslem world. On the local level, political parties and gatherings are not allowed. Trade or labour unions are also not allowed, yet professional gatherings are provided for under the umbrellas of the chambers of commerce, which total twenty two nationwide, or under the national universities of which seven are in full operation now.

## 1.4) Saudi Construction Industry

### 1.4.1) General Background

The central organizing agencies in construction are the consulting and construction firms. No Saudi firm combines both services for medium to large size projects, while foreign firms, mainly U.S., European or Japanese combine the two services in medium and large projects undertaken in Saudi Arabia.

### 1.4.2) Manpower

The Saudi construction industry is characterized by having the most diversified pattern of nationalities working for it. Over a hundred nationalities participate through its workforce in the industry. Saudi companies still rely heavily on nearby Arab and Asian manpower; either as architects and engineers, or as skilled and unskilled labour. Draftsmen,

accountants, managers, economists and computer operators are also mainly expatriates. New vocational institutes provide few Saudi technicians every year, but too few to change their percentage in comparison to others. Saudi engineers and architects tend to work mainly for the public sector or to set up their own contracting or consulting firms.

**1.4.3) Turnover**

Zahlan (1984) has shown that in 1980 the Arab construction industry was the third largest after that of the USA and Japan, exceeding that of France, Germany and the UK. Data compiled by the" Financial Times" (1981) shows that the construction in Saudi Arabia amounted to 28.5% of all construction in the Arab World (21 countries). "Engineering News Record" (1981) showed that the planned 1980-1985 annual expenditure of the public works and defense construction in Saudi Arabia was 26.5 billion US dollars, excluding private sector expenditure. Duffy (1982) estimated the world market of construction equipment in 1979 at 25 billion US $ (excluding the Comecon countries & China). The European market was worth 5 billion Dollars and the Arab World was worth 7 billion Dollars. The Saudi fourth five year plan assigned 30.3 billion US Dollars for the construction of major projects in the Kingdom. This is equivalent to 11% of the total budget of the plan. Major beneficiaries of the plans' budget were in descending order: The Ministry of Urban & Rural Affairs: 10.5 billion US $ (34.7% of the total budget for new construction), the educational, social and religious sectors 9.02 billion $ (29.7%), transportation 6.16 billion $ (20.3%) and 4 billion Dollars were assigned for housing, telecommunication and projects for Jubail and Yanbou industrial cities. Rutland and Hamra (1988) thought

that by the time the fourth development plan came into operation in 1985, much of the infrastructure had been completed, and the volume of new work was decreasing. This was essentially then a development plan of the stabilization and consolidation, with the intention that local contractors should play a large role in both new and maintenance work. On the other hand an amount equal to 39.7 billion US Dollars was assigned to maintenance and operation, an amount equivalent to 15% of the whole plan budget. The major beneficiaries of the operation and maintenance were in descending order: the Ministry of Health (28.5% of the budget), the Ministry of Urban and Rural Affairs (14.8%), the Ministry of Post, Telephone & Telegraph (PTT) 14%, Royal Commission for Jubail & Yanbou (8.8%), Presidency of Civil Aviation (5.9 %), water projects (5.6%) then follow other sectors, ports, pilgrims, roads, vocational training and education.

### 1.4.4) Competition

Saudi construction companies faced threats over two fronts. The overseas contractors were the first threat to local contractors. Strong financially and ahead in technology, the foreign contractor had a great chance of gaining big construction contracts at the beginning of the construction boom back in the mid Seventies. The average local contractor faced the second threat from the huge influx of small businessmen to the contracting arena, with the aim of quick and easy profit. The newcomers usually bid very low to get their first jobs, leaving the older ones quite unbusy. The early and mid-Eighties saw the stabilization of the contracting market with the withdrawal of most of the newcomers together with the financially weaker. They disappeared and much of their threat did. The first threat of foreign contractors also decreased gradually with the government taking the following

procedures:

1) A Government decision that 30% of the amount of any contract awarded to a foreign company be re-awarded through it to local Saudi contractors.
2) Splitting of huge projects into several ones, giving local contractors the opportunity to be pre-qualified for them.
3) Increase of open-bid policy, thus inviting more local contractors, increasing competition and finally decreasing overall contract sums.
4) Prequalification of local and foreign contractors, giving priority to local ones, thus eliminating the poorly organized and the financially weak from bidding in medium or large projects.
5) Royal decree No. 3/W/2601 dated 10/2/1401H permitting local contractors only, to bid for small and medium-sized road and bridge projects as well as small and medium building contracts, thus eliminating the foreign contractor's threat on local ones.

## Chapter 2

## Literature Review – Life Span of a claim

### Introduction

This chapter will discuss the parties involved in a construction project and are candidates to participate in the claims management procedures. They will either be claimants (initiating the claim) or defendants (receiving the claim) or third parties affected by the claim. A literature review will be conducted to cover all possible parties. The second part of this chapter will discuss the life span of a claim from initiation up to settlement and payment of sums due to a contract party. The literature review will unfold to a detailed anatomy of the life cycle of a claim with the purpose of identifying the variables that will be affected by a claim and also identifying the party impacted.

### What are claims?

While there is little doubt that construction claims are a burden on the industry, how a problem turns into a claim re0mains something of a puzzle. Much of the research on construction disputes has focused on specific factors, such as contractual language and its judicial interpretation, the technical causes of claims (Semple et al. 1994), the importance of front end planning (Vlatas 1986, Halligan et al. 1987), Construction contract claims have been a problem in the UK construction industry for decades. The Wood Report (1975), commissioned by the UK government, described claims and variations on construction projects as "the most vexatious areas of contractual relationships". Scott (1992), over a decade and a half later, contends that the use of the word claim still arouses emotions very often accompanied by acrimonious accusations. These emotions are contrary to

the acceptance in many circles that claims are a natural and inevitable consequence of modem contractual arrangements (Bradley and Langford, 1987). This reality is in fact recognized in the drafting of most standard forms through the inclusion of express provisions. Report research and expert commentaries aimed at finding solutions to the problem have followed one or both of two approaches: 'starting right' and 'staying right', to use the parlance of the US Construction Industry Institute (CII) committee on dispute management (Diekmann and Girard, 1995). Abdulmalak et al (2002) said that construction projects are becoming more and more complex due to new standards, advanced technologies, and owner-desired additions and changes. While the successful completion of projects has been thought to depend mainly on cooperation between the contractor, consultant, and owner, problems and disputes have always erupted due to conflicting opinions as to the various aspects of design and construction. They added that the increased complexity of construction processes, documents, and conditions of contracts has been contributing to higher possibilities of disputes, conflicting interpretations, and adversarial attitudes. In the construction industry, where contract documents define rights, obligations, and procedures a claim is a request by the contractor for an extension of time and/or additional cost can evolve into a disagreement that may not be amicably resolved by the parties concerned (Clough and Sears 1979; Jervis and Levin 1988; Barrie and Paulson 1992). Cheung et al (2000 b) see that project success is measured by the degree of achievement of project objectives, expressed in terms of time, cost and quality requirement, and that construction is a complex process that can confound the most intricate management systems, requiring the coordinated effort of a temporarily assembled task force of many independent participants, each having a different speciality, and each expecting to make a profit.

Inevitably this complexity creates problems. No design can ever be perfect, construction is not an exact science and unanticipated events can always be expected. Jensen et al (1997) stated that the construction contracting process is complex and thus requires a highly integrated set of contractual relationships. This contractual paradigm involves the owner, the design team, the general contractor, the project manager and numerous subcontractors and vendors. A result of this complex set of relationships is the frequent occurrence of contractual disputes (Medved, 1992). The most recurring disputes involve claims for additional time and/or work, with the former being the most commonly encountered claim type in the construction industry (Cushman, Hollyday, Miller & Kiernan, 1990; Nunnally, 1993). Scott (1997) sees that claims are an inevitable feature of major projects that will have to be dealt with on the majority of contracts let, and that changes will be made to the contract as it proceeds, and, where these involve additional work, adjusted payments will be necessary. Disagreements on the level of these payments will be a typical source of claims. Ren et al (2001) stated that over the past three decades, the construction industry has experienced an increase in claims, liability exposures and disputes, along with an increasing difficulty in reaching reasonable settlements in an effective, economical and timely manner (Barrie & Paulson, 1992). The unique, dynamic and complex nature of the industry inevitably leads to a situation where conflicts are bound to arise, and claims are inevitable. In fact, claims are now considered as a way of life for the construction industry (Bradley & Langford, 1987), as shown by the following:

- Onyango (1993) found that 52% of all UK construction projects ended up with a claim of some type;

- Keane (1994) reported that £1.2 billion could be the subject of construction claims or disputes at any one time and that more than 83% of contractors claimed for one or more time extensions during 1992-94 in the UK;

- Semple et al. (1994) identified that more than half of claims constituted an additional cost of at least 30% of the original contract value based on their survey of construction projects in Canada. In addition, about a third of claims amounted to at least 60% of the original contract value. In some cases, the claim values were almost as high as the original contract value.

To seek answers to the problem, numerous research projects, courses and publications on various aspects of claims, such as Wood (1975), Diekmann & Nelson (1985) and Levin (1998), have been undertaken to investigate industrial practices and to explore the principles and procedures of claim settlement and dispute avoidance. Basically, these efforts are of two kinds: those that seek answers from basic principles and legal issues at the pre-construction phase and those that attempt to solve the problem through claims management procedures at the construction phase (Field *et al* 1993). Vidogah & Ndekugri (1997) point out that claims management and 'people' issues may be, at least, as important as having a clear understanding of contractual terms and equitable risk allocation. Therefore, there is a need for complementary research into the claims management process. Kumaraswamy (1998) mapped the linkages between conflicts, claims, and disputes, and ascertained that most disputes arise from unresolved claims. In the United States, Hartman (1995) cited the high costs of litigation, which had reportedly reached as high as 20% of the cost of building in the $1980_S$. He also illustrated a commonly perceived project model that "starts with an agreement, is followed by construction

and culminates in disagreement". In the case of the Australian construction industry, Ridgway (1994) went further in linking claims and disputes to general cultural attitudes. In this context, Brooker and Lavers (1994) supported such a correlation with industry/national culture, through observations that the construction industries of some nations have longer and more profound experience of conflicts, or at least of formalized disputes, than others; for instance, there is a general reluctance to proceed to litigation (or even to formal "alternative dispute resolution's" processes) in most Eastern cultures. Levin (1998) explains how conflicting interpretations of contractual documents or instructions could also result in claims. He added that without any acknowledgment of obligation settlements, claims by construction contractors are either for financial compensation or for the relaxation of a liability for liquidated and ascertained damages, i.e., "extra money" or "extra time". In the United States, Diekmann and Nelson (1985) studied the frequency severity, and possible causal factors of claims on 22 federally funded projects. From the 427 claims, they found that "design errors" accounted for 46%, while an additional 46%, were due to discretionary or mandatory changes.

**Claims management**

Ren et al (2001) see that claims management is the process of employing and co-ordinating resources to progress a claim from identification and analysis through preparation, and presentation, to negotiation and settlement (Keane, 1994). The aim of claims management is to ensure that the client pays a fair price for interfering with the contract in the execution of the work (Bramble & Callahan, 1992). Besides the management activities at the construction phase, claims management is

also heavily dependent on the legal principles and other management theories at pre-construction phase, which mainly includes standard construction contract forms, risk management theory and project procurement systems. These principles and theories are vital to avoid construction claims and disputes in the first place, and to ensure that claims management starts right if claims cannot be avoided. To understand claims management fully, it is therefore necessary to explore the development of these theories and principles. Levin (1998) standardizes the management process as:

(a) recognition and identification of changes or the causes of claims;

(b) notification to the engineer and the client;

(c) systematic and accurate documentation;

(d) analysis of time and cost impact;

(e) pricing;

(f) negotiation;

(g) dispute resolution and settlement.

Scott (1997) suggested that the basic approach adopted by most supervisors in assessing the claims was as follows':

1- Check the facts of the contractor's submission.

2- Identify or verify the critical path.

3- Check whether the delays on that path have had a shunting effect on the activities.

4- If some of the delays on the critical path would cause an extension of time, then an extension of time may well be justified.

**Definition and Causes**

A delay claim is classified as either a suspension, a disruption, acceleration, or an extension (Jensen et al 1997). Delay is defined as any time extension to the construction process that extends, or postpones, the completion date past the date specified by the contract documents (Neil, l982). Yogeswaran et al (1998) see that claims may be made by a contractor to avoid (or reduce) liquidated damages and/or to establish an entitlement to extra payments (e.g. for overheads) during; the extended period. Vidogah and Ndekugri (1998) said that (i) claims management is still performed in an ad hoc manner; (ii) contractors' management information systems are ill designed to support claims; (iii) the products of basic good management practice, such as diaries, timesheets, and programmes, often are inadequate in content even if available; and (iv) some aspects of claims are impossible to quantify with precision even with the best information available at reasonable cost. They added that main remedial measures suggested include: (a) greater emphasis on the quality of claims management practice and information systems during evaluation of tenders; (b) agreeing figures usually in contention as terms of contracts; (c) implementation of electronic document management systems; and (d) stricter contractual provisions on the quality of programmes, timesheets and content of claims. Abd. Majid and McCaffer (1998) said that delays are among the most common phenomena in the construction industry. They added that during the past three decades records show that delays and cost overruns are common in construction projects. Morris et al. (1989) evaluated the records of more than 4,000 projects between 1959 and 1986 and concluded that the success rate of projects is generally poor. He further emphasized that there are very few records showing underruns. Several other studies have been conducted, which attempt to evaluate the influence

of delays on performance: Tah (1993) stated that poor performance of projects in terms of time and cost overruns is commonplace in the construction industry. Rad (1979) reported that the increase in cost and overall duration of nuclear power plant projects in the United States was very high. Arditi et al. (1985) indicated that some 18% of the projects in Turkey were delayed by as much as four years and some experienced in an over 200% delay of the scheduled program. Assaf et al. (1995) studied the causes of delays in large building projects in Saudi Arabia and identified materials-related delays as the main cause of project delays. The delays by a client, such as changes in scope of work, failure to provide access, failure to make progress payments ,etc. Levin (1998) sees that the current industry practice shows that the main challenge of claims management is not from the overall management process, but from the ineffectiveness of management activity at each stage. Kumaraswamy and Chan (1998) said in their research that the analysis of the responses reveals differences in perceptions of the relative significance of factors between clients, consultants and contractors. They added that of the main factors causing delays, as perceived by different industry subsectors: clients, consultants and contractors. The degree of agreement/ disagreement between the subsectors as to the importance of these factors is also indicated, The questionnaire survey from Kumaraswamy and Chan (1998)indicated the perceived importance of the impact on construction delays of the contractor-related, design-team-related and labour-related factor categories. They added that it is suggested that the apparent collective biases of different industry groups may often direct blame for delays to other groups, and discourage a search for the root causes of delays and solutions to same. The origin of such biases may be traced to group conditioning, as well as to the present adversarial nature of the contractual

systems, including the clashes, blame allocation and defensive postures induced by the not uncommon 'extension of time' claims and associated costs in construction contracts. Ren et al (2001) see that since the end of the $1970_{s,}$ an obvious change in the construction industry has been the increasing project size, technical complexity and high risks, which have led to a large number of change orders. Diekmann & Girard (1995) report that people and management issues may be more influential on the incidence than risk allocation and project characteristics. Abdulmalak et al (2002) stated that claims and disputes arise from a number of cases, namely defective specifications, differing site conditions, an increase in scope of work, restricted access to site, owner-caused disruptions or delays, disagreement as to what constitutes a substantial completion, interpretation of site instructions, and enforcement of liquidated damages, among others. They added that it is important for the owner, when analyzing a claim presented by the contractor ,to ask the following questions: Were the contract requirements met? Did the contractor refer to the proper clauses in the contract? Does the owner or consultant bear part of the responsibility? Was the situation predictable at the time the 1 contract was signed? Were the specifications defective? Was the contract misinterpreted? And, if so, which competing interpretation will rule? Jensen et al (1997) see that a time related claim occurs because of the negative financial impact this scenario has on the project's rate of return. Yogeswaran et al (1998) see that causes that may give rise to claims for extensions of time are:

Inclement weather, Hoisting of storm signal No.8 or above, Instruction issued to resolve discrepancy, Variation order, Substantial increase in quantity of any work item not resulting from a variation, Delayed possession of site, Disruption to regular progress due to:

late instruction, variation, opening for inspection, delay caused by any person or organization employed by the employer, and late delivery of materials by the employer

Suspension of works by the employer, Delay caused by an utility undertaking or duly constituted authority, Delay caused by nominated sub-contractor and Any other special circumstances. Vidogah and Ndekugri (1998) see that despite the efforts, claims have continued to be a problem. Other research and expert commentaries suggest that claims management and 'people' issues may be, at least, as important as having a clear under- standing of contractual terms and equitable risk allocation. For example, Diekmann and Girard (1995) reported, after studies of completed projects in the USA, that people and management issues may be more influential on the incidence of disputes than risk allocation.

Brewer (1993) explains that the management problem concerns the ability of parties to identify, on a regular basis, the claimant's entitlement, with adequate documentation to ensure payment through the interim payment mechanism. With claims allowed by the A/E, the traditional attitude of owners has been to take it all on the chin with recriminations sometimes of an unhealthy 'claims attitude' on the part of contractors. The contribution of the consultants was rarely ever questioned. However, this attitude is changing. Recent cases brought before English courts should send a chill down many an A/E's spine. In *Wessex Regional Health Authority v H.L.M. Design Ltd* (1994) 71 BLR 32 architects were found liable to the owner for claims won by a contractor. In *Mid-Glamorgan County Council v Devonald Williams and Partners* (1991) 29 ConLR 84 the owner brought proceedings against its architects alleging failure to supply information on time, among other complaints. In *Wharf Properties Ltd v Eric Cumine Associates No. 2* (1991) 52 BLR 1, a Hong Kong case

which was appealed to the Privy Council (the highest appeal court for British colonies that have retained its jurisdiction) in the UK, the owner reached a compromise on claims with contractors and then sought to recover his liability from the architects on grounds of their having issued unnecessary and excessive variations. The suit was struck off but only on grounds of failure to provide sufficient particulars on the quantum of damages sought. Levin (1998) sees that a claim could, of course, also arise in the British/Hong Kong-type scenarios for such perceived breach of contract; and in all scenarios for breach of some other "common law" duty in tort. Or claims could be quasi-contractual and could lead to either *quantum meruit* (as much as is deserved, in the absence of a contract) or ex *gratia* (as a favour/gift). Kangari (1987) sees that there are four major areas of causes of delays: 1) Delays caused by unforeseen conditions, 2) Delays caused by the Owner, 3) Delays caused by the Architect/Engineer and 4) Delays caused by the Contractor. A study conducted by the US Army Construction Engineering Research Laboratory indicated that three primary areas of delay occurred in design, owner modification, and weather.

Documenting delays is an essential step for all contracting parties concerned. Barrie and Paulson state that the most important guidelines to follow regarding "changes, delays, disputes, and claims" are as follows:

1- Documentation
2- Knowledge of contracts and the law
3- Good working relationships between all parties to the contract

Potential delay factors were identified from a literature review by Kumaraswamy and Chan (1998) and were classified into eight factor categories as follows:

1 - project related;

2- client-related:

3- design team related:

4- contractor-related:

5- material-related;

6- labour-related:

7- plant equipment- related;

8- external factors.

From Kumaraswamy and Chan (1998) the ten most significant factors causing delays in building works were:

Poor site management and supervision

Unforeseen ground / conditions

Delays in design information

Lack of communication between consultant and contractor

Inadequate contractor experience

Low speed of:

Decision making
Involving all project teams
Client-initiated variations
Necessary variations of works
Delays in subcontractor's work
Improper control over site resource allocation

**Groups of claims**

Excusable delays without compensation are delays caused by neither the client nor the contractor. The causes of these delays include acts of God, act of a public enemy, war, and possibly acts of another contractor.

Non Excusable Delays (NEDs) are the responsibility of the contractor, and the client may be entitled to claim damages. Examples of these causes of delays include: materials- related delays, labor-related delays, equipment-related delays, improper planning, and financial delays. Assaf et al. (1995), Yates (1993), and Arditi et al. (1985) studied the causes of delays and classified them into several groups. This classification formed the basis for classification of the main causes of NED. The groups of main causes are as follows:

1- Materials-related delays
2- Labor-related delays
3- Equipment delays
4- Financial delays
5- Improper planning
6- Lack of control
7- Subcontractor delays
8- Poor coordination
9- Inadequate supervision
10- Improper construction methods
11- Technical personnel shortages
12- Poor communication

Vidogah and Ndekugri (1998) see that heads of claims likely to be disputed from the consultants view are:

- On-site overheads
- Head office overheads
- Loss of profit
- Inflation of costs
- Interest and finance charges
- Cost of disruption
- Cost of preparing claims

Ren et al (2001) said that unforeseeable site conditions, unrealistic planning and specifications, changes by the client, acceleration, unfulfilled duties by project participants and 'force majeure' are the direct causes for claims. Levin (1998) sees that following the justification of a claim, the next task is to quantify the claim, which includes both the direct costs or delays caused by the unanticipated events, and the cumulative impacts of such events. However, arguments are often generated about the rates of compensation, quantity of the impacts, and especially the composition of the cumulative effects of the claim event, such as loss of productivity, disruption and indirect costs. In Ontario, Canada, Bristow and Vasillopoulos (1995) identified five primary causes of claims:

a. Unrealistic expectations by the parties
b. Ambiguous contract documents
c. Poor communications between project participants
d. Lack of team spirit among participants
e. Failure of participants to deal promptly with changes and unexpected conditions

In western Canada, Semple et al. (1994) examined the causes of claims delays and cost overruns on 24 projects. While noting the criticality of changes, extras, soil/site conditions, and delays, they identified six common contract clauses cited in claims (relating to the Canadian Form of Contract used); six common "categories" of disputed claims (premium time, equipment costs, financing costs, loss of revenue, loss of productivity and site overhead ; and four common causes of claims:

a. Acceleration
b. Restricted access
c. Weather/cold
d. Increase in scope

Kumaraswamy (1998) concludes that the top 10 Common Causes of Construction Claims as Perceived by Contractors, Clients, and Consultants; in Descending Order were Exaggerated claims (by contractors), Inadequate site investigations, Inaccurate design information Poor communications, Midstream changes by client, Inadequate contract documentation, Inadequate design documentation, Estimating errors (by contractor), Incomplete tender information and Inadequate contract administration. Kumaraswamy (op cit) added that the top 10 Common Categories of Construction Claims as Perceived by Contractors, Clients, and Consultants; In Descending Order were Variations due to design errors/ambiguities, Variations due to ground conditions, Interference with utility lines, Prolongation, Delayed design information, Ambiguities in contract documents, Delayed possession of site, Variations due to client changes, Variations due to other site conditions and Errors/substantial changes in Bills of Quantities.

| **Researcher** | **Groups and Causes of claims** |
|---|---|
| Ass of et al (1998)<br>Yates (1993)<br>Ardeti et al (1985) | Materials-related delays, Labor-related delays, Equipment delays, Financial delays, Improper planning, Lack of control, Subcontractor delays, Poor coordination, Inadequate supervision, Improper construction methods, Technical personnel shortages, Poor communication |
| Vedogah and Ndekugari (1998) | On-site overheads, Head office overheads<br>Loss of profit, Inflation of costs, Interest and finance charges, Cost of disruption, Cost of preparing claims |
| Ren etal (2001) | Unforeseeable site conditions, unrealistic planning and specifications, changes by the client, acceleration, unfulfilled duties by project participants and 'force majeure' are the direct causes for claims. |
| Bristow and Vasillopoulous | Unrealistic expectations by the parties, Ambiguous contract documents, Poor communications between |

| | |
|---|---|
| (1995) | project participants, Lack of team spirit among participants, Failure of participants to deal promptly with changes and unexpected conditions |
| Semple et al (1998) | Acceleration, Restricted access, Weather/cold, Increase in scope |
| Kumaraswamy (1998) | Exaggerated claims (by contractors), Inadequate site investigations, Inaccurate design information Poor communications, Midstream changes by client, Inadequate contract documentation, Inadequate design documentation, Estimating errors (by contractor), Incomplete tender information and Inadequate contract administration. |
| Cheung et al (2001) | Budget overrun; outstanding payment; different percentage of claim submission and certification; number of days behind programme;<br>liquidated damages; and percentage change from original design. |

**Table (2-1) A summary of groups and causes of claims from different researchers**

Molenaor et al (2000) stated that the characteristics that influence disputes were classified into three main categories: (1) people issues; (2) process issues; and (3) project issues. People issues involve organizations, relationships, roles, responsibilities, and expectations that affect these people. Process issues involve the manner in which the contract and building are carried out. Project issues include those characteristics that define the technical nature of the work. He saw that these characteristics were grouped together into seven hybrid variables:

Owner Management and Organization ,Contractor Management and Organization, Project Complexity, Project Size, Financial Planning, Project Scope Definition, and Risk Allocation. The primary results of the study can be summarized by stating that people do not cause disputes, but people do affect dispute performance more than any other variable. Large, complex projects or those with improper risk allocation can be inherently tougher, but the people have the greatest affect on the performance. The impact of the process issues falls some where between the impact of

project and the impact of people. Molenaor et al (op cit) see that a measurement of Contractor Management Ability is actually a combination of seven separate measurements. 1, Upper Management Support and Response; 2, Contractor Responsibility Structure; 3, Contractor Organizational Experience; 4b, Contractor Organizational Success; 5 , Competence of Project Individuals; 6, Interpersonal Skills of Project Individuals and 9 History of Owner and Contractor Relationship.

| **Researcher** | **Categories of claims** |
|---|---|
| Semple et al (1994) | premium time, equipment costs, financing costs, loss of revenue, loss of productivity and site overhead |
| Kumaraswamy (1998) | Variations due to design errors/ambiguities, Variations due to ground conditions, Interference with utility lines, Prolongation, Delayed design information, Ambiguities in contract documents, Delayed possession of site, Variations due to client changes, Variations due to other site conditions and Errors/substantial changes in Bills of Quantities. |
| Molenaor (2000) | (1) People issues; (2) process issues; and (3) project issues. People issues involve organizations, relationships, roles, responsibilities, and expectations that affect these people. Process issues involve the manner in which the contract and building are carried out. Project issues include those characteristics that define the technical nature of the work. |

**Table (2-2) A summary of categories of claims from different researchers**

Cheung et al (2000 a) see a conceptual framework for the variables as follows:

**Environment Specific**

- ❖ Work market
- ❖ Inflation

**Organization Specific**

- ❖ Contractor's workload
- ❖ Contractor's profit status
- ❖ Claim consciousness of the contractor.
- ❖ Contractor's need for the work
- ❖ Contractor's experience with the type of construction
- ❖ Client's experience with the type of construction
- ❖ Previous working relationship between the client and the contractor
- ❖ Client's budget constraint
- ❖ The origin of the contractor
- ❖ The origin of the client

**Project Specific**

- ❖ Design complexity
- ❖ Construction complexity
- ❖ Design Changes
- ❖ Relationship between project personnel
- ❖ Degree of nomination
- ❖ Clarity of contract document
- ❖ Project selection criteria
- ❖ Contractor selection process
- ❖ Conditions of Contract (risks allocation)

- ❖ Contractual obligations
- ❖ Client's involvement in the running of the project
- ❖ Power balance

**Process Specific**

- ❖ Senior management involvement (contractor)
- ❖ Senior management involvement (client)
- ❖ Involvement of claim consultants (contractor)
- ❖ Involvement of claim consultants (client)
- ❖ Alternative dispute resolution
- ❖ Element of trust
- ❖ Motivation to settle (contractor)
- ❖ Motivation to settle (client)
- ❖ Negotiation skill (contractor)
- ❖ Negotiation skill (client)
- ❖ Expectation of future work (contractor)
- ❖ Expectation of future work (client)

Cheung et al (2001) identified six common causes of dispute as follows:

1) budget overrun;
2) outstanding payment;
3) different percentage of claim submission and certification;
4) number of days behind programme;
5) liquidated damages; and
6) percentage change from original design.

In addition, six variables were used to describe the characteristic of each project namely

1) the complexity of project;
2) nature of work;
3) nature of client;
4) time constraint;
5) procurement method; and
6) level of subcontracting.

| **Researcher** | **Variables affecting claims** |
|---|---|
| Molenaor (2000) | Owner Management and Organization ,Contractor Management and Organization, Project Complexity, Project Size, Financial Planning, Project Scope Definition, and Risk Allocation. |
| Cheung et al (2000 a) | Environment Specific, Organization Specific, Project Specific, Process Specific |
| Cheung et al (2001) | The complexity of project; nature of work; nature of client; time constraint; procurement method; and level of subcontracting. |

**Table (2-3) A summary of variables affecting claims (from different researchers).**

**Life cycle of a claim**

## 2.1) Initiation

The construction industry's intricate relation of parties is a complicated one, thus giving rise to a great number of possibilities of parties initiating claims against each other. Powell-Smith and Sims (1988) state that a dictionary definition of the word 'claim'is an assertion of a right to something'. For the purposes of their book the term may be defined as (the assertion of a right to payment arising under the express or implied terms of a building contract, other than under the ordinary contract provisions for payment of the value of the work). Chapell (1984) defined the claim by saying that (a claim is a demand that one's rights be satisfied). The word 'claim' is very emotive in the construction industry. Contractors are often referred to as being 'claims conscious'. This type of contractor is generally disliked by the architect and the employer. The use of the phrase is unreasonably attached to contractors who make a habit of presenting claims during a contract. It does not usually have any bearing on whether the claims are justified or not. Very often the contractor will not make a claim because he does not have the knowledge or time to present it properly. While Hughes and Barber (1992) said that a claim is

a) a demand or, if something less strong is preferred, a request or an application for something to which
b) a contractor (including quite scrupulous ones) considers, believes or contends (rightly or wrongly) he is entitled but in respect of which
c) agreement has not yet been reached

They decided that that the word 'claim' will be used to mean simply a request, demand, application for payment or notification of presumed

entitlement to which the contractor, rightly or wrongly at that stage, considers himself entitled and in respect of which agreement has not yet been reached. The Lord Pennock of Norton was quoted by Baden Hellard (1988) as saying that disputes are almost inevitable in the fulfilment of construction contracts and, with those of significant magnitude or time span, the propensity for dispute is greater. This can arise out of interpretations of the contract. It can arise out of changes in circumstance from those envisaged at the time that the contract was agreed. It can arise out of inaccurate judgments on which the contract was based leading to adverse consequences in the outcome. There could be numerous claims throughout the life span of any construction project.

This chapter discusses the following:

I. Initiation
II. Notice
III. Preparation
IV. Format
V. Scale
VI. Status
VII. Filing/Examination
VIII. Process/Decision/Establishment of Claim
IX. Type
X. Settlement
XI. Payment

### 2.1.1) Parties To Claims:

These could be divided into two groups:

The Construction Group

Others

### 2.1.1.1) The Construction Group:

This can be further sub-divided into:

A) Client Group

B) Engineering Group

C) Contractors Group

Halpin and Woodhead (1980) discussed the intricate relations in construction by saying that the relationship of one agent to another in the construction environment is often very complex but can generally be described by one or more basic types. These basic relationships include

(1) *the master-servant* relationship in which one agent hires the services of another for wages;

(2) the *business-service* relationship that characterizes the freedom of interchange of goods in the market place;

(3) the *contractual* or formal *legal obligation* relationship in which one agent or group of agents freely bind themselves to another for a consideration to perform some services under uniquely defined constraints or contract conditions; and

(4) that of the *intimate co-operation of equals* in a team effort.

### A) Client Group:

The client group is made up of the following: Client, Construction Manager (CM), Project Manager, (PM) Insurer and Financier. On the different parties' relationship, Baden Hellard (1988) discussed the issue by saying that initially the relationship between the builder and the client,

or group requiring the building was simple. The customary practices and the relationships between the different groups have been further complicated by the organizational or contractual groupings of the different functional elements. Multi-disciplinary professional firms, sometimes combine with general building contractors to carry out specific projects as joint ventures, whilst the combination of specialist suppliers and sub-contractors with, or as offshoots from, larger main contractors, are probably now the norm on any large project. The ultimate in this situation has probably been reached on projects like the Channel Tunnel where several general contracting firms in the UK and in France combined with several banks to become two entrepreneurial companies, indivisibly linked by dividing each share into half held in each other's company.

**ii) Client**

Who could be an individual, company, institution, government body, society or any other form who owns the project and gets into contract with a contractor (or contractors) in order to construct his project. This client will before getting in contract with a contractor, seek professional advice to make the necessary studies for feasibility, planning, design, procurement and contract formulation. Baden Hellard (1988) mentioned up to fourteen public and professional contacts to be made before a client can sign a contract with a contractor, so as to ensure that the client's requirements can be met. Clients may (and do) initiate claims against other members of their group mentioned herinafter, as well as those in the other two aforementioned groups under

b) engineering group and

c) contractor's group

In fact any member of any group may (and does) initiate claims

against other members of his or other groups. The splitting of parties is for the purpose of classification and ease of reference.

**Clients relations**

The client's relation in small to medium projects starts with a contract with an architect who will put on paper all the client's requirements and try to design a project within the budget stated by the client. Large projects start with the client's agreement with a project manager who will take care of all professional, technical, administrative and financial matters concerning the project, representing the client, who will be in a supervising position. The project manager will, in turn, hire an architect to start the design stage.The first possibility of a claim initiated by the owner could be against the architect. Causes for such a claim (and all others) will be discussed in a later chapter. The client enters into a contract with a quantity surveyor who is responsible for preparing the necessary estimates of quantities of work to be contracted, based on the drawings provided by the architect - this professional is the second possibility against whom the client can raise a claim. The client will then hire an engineer to supervise the work on site, as per the drawings, specifications, contract and contract documents. This professional makes the third possibility of a claims filed by the client. In the case of big complex projects, the client will have his project manager in the front line dealing, among others, with the architect, engineer and quantity surveyor. This relation will create another possibility of claims filed by the client against his project manager in case of the project manager not fulfilling his contractual professional obligation, (which will be discussed in detail in the next chapter). The construction manager,(CM), who is hired by the client in some procurement methods to manage the different professionals involved in the project, may provide

grounds to the client for claims initiation if the latter thought he had incurred any losses directly attributable to his CM. The financier to the client, who provides the necessary funds for construction and other services of the project, and who entered into a contract with the client for such services, could furnish grounds for the client to claim against. The financier is not generally involved in the construction process, but still plays a vital role in the realisation of the project, and is susceptible to be involved in a claim initiated by the client. The insurer is the company providing insurance services to the client through different policies. These may include insurance for the construction process, acts of God, man-made causes, shipping and others. Buying such policies puts the client legally into contract with the insurance company, thus with the possibility of claims arising from this contractual relationship by the client. The client's contractual relationship with parties of the contractor's group is largely dependant on the method of procurement of the project, which dictates the relationship pattern. Thus depending on such contractual relationships, the client can have different possibilities of claiming against those parties. The first possibility of claims by the client arises from his contractual relation with the contractor. This could be a small company, a medium/large company, a joint venture, a consortium, a main contractor, or one of multiple main (prime) contractors .This relationship is the historically oldest between the parties of construction and started long ago when the client approached the contractor directly before architects or engineers emerged as necessary professional parties to the construction process .Although the oldest and most established, this contractual relationship binds two parties with completely different goals of getting into the contract and thus provides a fertile ground for claims to arise. The client may claim secondly on sub-contractors. Either directly, if he has the legal relationship with them, or through the main contractor, if

no direct contractual relation is established between him and those sub-contractors he is claiming against. The privity of contract concept prevents the client from directly claiming against or suing the sub-contractor with whom he has no contractual relation. Nominated sub-contractors pose some shadow to the real contractual relation between the client and the main contractor. If a client chooses a specific sub-contractor to perform the work, and asks the main contractor to employ the former, then a delicate situation arises where the main contractor denies acceptance of any claim by the client against his (contractor's) work, if it relates to the nominated sub-contractor. The main contractors argue that its the client's responsibility to ensure that the nominated sub-contractors perform up to the client's satisfaction, while the client argues back that once the main contractor agrees to have the nominated sub-contractor on his workforce, then it is solely the main contractor's responsibility if the nominated sub-contractor defaults. This matter will continue, if not provided for in the contract, to cause contractual hazards to the client and main contractor as well. Suppliers are also one party of the constructors' group and will, if procurement methods permit, create another possibility of claims arising by the client. If suppliers are the main contractor's responsibility and the owner has any claim against one or more of them, then the client would claim against the main contractor under the concept of the privity of contract. Shippers can have direct contractual relation with the client in some procurement forms thus facing the possibility of being claimed against by the client. Rarely will a client want to claim against a shipper if it's the main contractor's responsibility to guarantee safety and timely delivery of shipments, yet the possibility still remains valid. In all the previous possible cases, the client can be the claimant himself as an individual, or through others. These include employees, representatives, lawyers, architects, project managers,

construction managers or quantity surveyors, unless this party claiming in place of the client is directly involved in the claim. It is obvious that a client, in the complex relations of a construction process, can be the claimant as well as can be the defendant of a claim from those same parties mentioned above.

**iii) Construction Manger (CM)**

The construction manager is the professional who, in place of the client, Will manage the other professionals involved in the construction process. He has only one contractual relation, and that is with the client His relations with the other professionals (of the engineering group) or with those of the constructors' or client's groups are only as a representative of the client. The only possibility of a claim arising by the construction manager is against the client. If a need rises to claim against any other party, the CM will have to do so by claiming against the client; the sole party with whom the CM has a contractual relationship. The client in turn will raise the claim against the party with which he (client) has a contract and whom the CM is claiming against.

**iv) Project Manager (PM)**

The project manager is the professional who manages all aspects of a project. He will cater for legal, financial matters, employing the necessary professionals for each discipline and managing them all to fulfill all the goals put forward by his employer; the client. Loraine (1992) discussed the project manager's role and that he should provide a report covering

- progress
- operating performance and end forecasts
- personnel, including health and safety
- client relations

- security
- interterritory relationships: legal, fiscal and public
- contractual matters
- resource deficiencies.

They concluded by saying that project managers (PM) have the responsibility for controlling the project. Further, they make sure that there is a timely accounting of the progress of the project by conducting periodic reviews of time and cost. They added that among planning, organizing and controlling, the third managerial function has the highest significance to project managers. The PM thus has only one contractual relationship and that is with the client. his other relations with the other professionals are merely as a representative to the client. Any claim he wants to raise against other parties will, as was the case with the CM, be directed at the client. Thus the other possibility is that the PM will file a claim against his employer (the client), which he can do directly, based on the contractual relationship he has with him. Alexander Hamilton's Institute (1998) explained the project management concept by saying that a project management plan enables one to obtain answers to five crucial questions :-

- What will be accomplished by the project?
- How will it be achieved?
- Where will it be accomplished?
- When will the project be completed?
- Who will perform the activities?

They discussed the project manager's role by stating that project managers have the overall responsibility for planning, organizing and controlling. They are responsible for ensuring that the planning phase of a project involves a complete task description, a thorough resource needs

analysis, a practical time schedule, and a sound definition of requirements. In addition, they must organize the project so that sufficient staffing is available to produce the necessary services for reaching the project's objectives. They must ensure that those individuals participating in the project have sufficient authority and responsibility to accomplish their tasks.

**v) Financier**

This could by any financial institution which agreed to giving financial loans (either in funds or otherwise) as a lender, partner, or other forms of finance, to pay for material, workmanship or services. The client enters into a contract with the financier, who is not directly involved in the construction process, but yet could have a claim against the client. Financial institutions could have a direct relation with contractors, giving them loans or financing their purchase of materials or machinery, thus giving another possibility of the financier raising a claim against the main contractor. Furthermore the financial institution could be financing subcontractors, suppliers and shippers, thus adding further possibilities of raising claims against these parties. Financial institutions giving loans to architects, engineers, quantity surveyors, construction managers or project managers will do so to help finance the private practice of the party getting the loan as a whole, and has no direct relation to a particular construction project. This will eliminate the possibility of any claims by financiers against these professionals relevant to a construction project in particular. The financier could as well be defendant of claims arising from the same parties with whom he possibly would have a contractual relationship; namely the client, contractor, subcontractor, supplier and shipper.

**vi) Insurer**

This is the insurance company giving insurance policies to the parties in the construction industry. The insurer could issue these policies to the client who owns the project, to insure him against acts of God, man made causes or other risks. The professional group in the construction process also buy policies to cover their work: the design (for the architect) the supervision (for engineer) and other professional services by the quantity surveyor, construction manager and project manager. The main contractor usually buys policies covering fire risks and others covering acts of God, man-made causes and will insure his equipment, site and labourers. Sub-contractors will also buy policies similar to that of the main contractor, but for only those parts of the jobs they are responsible for. Suppliers and shippers, too, insure against their own risks. In this way the insurer has many possibilities of claims starting with the client and touching on the architect, engineer, construction manager, project manager and quantity surveyor and ending with the constructors' group; the main contractor, the sub-contractor, the supplier and the shipper. Although the insurer is not directly involved in the construction process, yet he bears great possibilities of raising claims due to his contractual relationship with various parties involved in the construction process, which is a high risk conversely, the insurer has the possibility of defending himself against claims filed by the same parties with whom he has contractual relations; namely the client, contractor, sub-contractor, supplier, shipper, architect, engineer, construction manager, project manager and quantity surveyor.

**2.1.1.2) Engineering Group**

This is a group of professionals who individually or collectively give the necessary technical services to prepare for and construct the

project.

**i) The Architect**

This professional enters into a contract with the client to set up the necessary design drawings. He has to collaborate with other professionals of different disciplines to generate the final set of drawings. This is a professional who starts work early in the project life. Discussing the architect's powers, Powell Smith and Sims (1988) state that under JCT contracts the architect's powers are limited. For example, JCT 80, clause 4.1.1 [JCT 63, clause 2(1)], obliges the contractor to comply only with the instructions 'expressly empowered by the conditions', and a later sub-clause provides a method whereby the contractor may challenge the architect's authority to issue a particular instruction. And explaining his role, they stated that in a claim situation, the architect can certify the payment sums only which the express terms of the contract authorize him to so certify. Under the JCT Standard Forms the architect has no power to certify amounts in respect of common law, quantum meruit or ex gratia claims. A contract may of course, endow the architect with authority to do so. They argue his role by saying that all too often architects assume, incorrectly, that they enjoy inherent powers to act as the employer's agents in all respects. The same mistaken assumption is often made by contractors who consequently are disappointed when the architect correctly refuses to certify payment for such claims. Under the JCT Forms of Contract the powers of the architect as agent to the employer and to certify sums for payment are closely defined, and the architect may himself be at risk if he exceeds the powers so conferred upon him. Addressing the issue of liabilities of professionals, Coombes Davies (1992) said that a professional such as an architect or an engineer may remain liable where he has delegated design work to a specialist sub-

contractor, particularly where he has had no authority from his client to delegate the design of any part of that structure. However, under the RIBA Conditions of Engagement, an architect may nominate a suitable specialist to carry out work which he is not equipped to do himself. Thus where the conditions are part of the architect's contract, he will normally carry no legal responsibility for the work to be done by the expert. Coombes Davies (op cit) discussed the defects caused by poor design, by saying that a term may be implied into a JCT contract which imposes upon the contractor a duty to warn the client and architect if he has reason to believe that the design is or has become defective. Likewise, an architect may owe a duty to the contractor, by implying a term within a JCT contract to warn him if the contractor is making a serious and potentially expensive error in defective design. The architect's only relation by contract is with the client. His relations with other professionals are only technical and not contractual, thus the possibility of a claim arising from the architect would be against the client, either claiming directly from the client or claims against those with whome the client has a contractual relationship. The other possibility will be against the insurer. The architect could as well be the defendant against claims directly filed by the client, or by parties in contract with the client and with no contractual relationship with the architect, as well as by the insurer. Baden Hellard (1988) discusses the role of the architect by saying that in the construction industry it has been customary for standard forms of contract to nominate the architect "or the engineer" as a quasi-arbitrator. It was thought that as the architect or the engineer was not a party to the building contract he was therefore in this position of quasi-arbitrator and able to determine matters in difference between the parties to the contract and that he would do so as an impartial and technical arbitrator.

**ii) The Engineer**

Haswell and de Silva (1982) define this professional as the person or persons duly appointed by the Promoter to take on the overall engineering responsibility for the establishment of a project of a civil engineering nature. The duties of the Engineer include initial studies, feasibility reports, design, preparation of 'Tender and Contract Documents and Drawings' and the supervision of construction during the execution of the project. This professional acts on behalf of the client in supervising the work on site, and enters with the client in a contract to render his technical services. Sawyer (1985) comments on the role of the engineer by saying that he is cited as an authority and one who gives instructions and directions and who can exercise options for opinions on appropriate occasions. He can vary the method of construction of the works to achieve completion but under no circumstances is he empowered to alter the contract made between the employer and the contractor. He can only implement in accordance with the terms, which the parties thereto have agreed. This professional, as is the case with the architect, has to collaborate his work with several disciplines with whom he has no direct contractual relationship. The engineer has a contract with the insurer to cover his technical risks. Sawyer (op cit) argues that in the event that the engineer acted without impartiality the contractor has the right to complain to the employer and if not satisfied with the result could, in England, take the matter to courts seeking to have the engineer removed and another appointed in his place. Discussing the relationship ,Sawyer (op cit) states that the employer in appointing the engineer, undertakes to make payment for his services, but this does not necessarily make the engineer an employee of the employer in relation to the construction contract .His particular status as a quasi-judicial and

independent person places the engineer in the particular position which carries with it liabilities in their own right which are different from those which otherwise might have arisen as being an employee of the employer.The Engineer's professional services on a project of a civil engineering nature may be expressed in the following terms:

(a) Duration of engagement

(b) Ownership of documents and copyright

(c) Arbitration clause for settlement of disputes, which may arise out of the engagement

(d) Scope of Consulting Engineer's services

(e) Information and services (if any) to be provided by the Promoter to the Engineer

(f) Terms of Payment

(g) Fees payable in the event of postponement, cancellation or abandonment of the project

(h) Effect of Force Majeure on the services to be rendered by the Engineer

(i) The responsibilities of the parties in respect of taxation, customs, duties and other dues

(j) Places at which notices are to be served under the Agreement

(k) Language to be used in correspondence and documents in connection with the Agreement

(l) Law applicable to the agreement.

Haswell and de Silva (op cit) point out that certain points that require to be noted when entering into a service agreement are that:

(a)The Engineer must ensure that his appointment is within the scope of the Promoter's authority, and

(b) The Engineer's authority is terminated on bankruptcy of the Promoter.

Thus the possibility of raising claims by the engineer would be either directly against the client or against a party in contract with the client, or against the insurer in case the need rises to claim against him. The engineer could as well be in a defending position against claims by the client or through the client by a party in contract with the client, or by the insurer. In comparing relationships Sawyer (1985) states that the appointment of the engineer for any enterprise generally requires him to enter into a separate contract with the employer such as the British Association of Consultant Engineers Model Forms of Service Agreement, by which the Employer and the Engineer become bound in contract. The Engineer and the Employer are not bound together by the FIDIC Conditions of Contract as this is a Contract between the Employer and the Contractor for the construction of the works, but once the Engineer has been appointed it is customary for the Employer to have complete confidence in him to act in accordance with the requirement of both the FIDIC Contract and their personal Contract which binds them together for this Enterprise. This professional, as is the case with the architect has to collaborate his work with several disciplines with whom he has no direct contractual relationship. The engineer has a contract with the insurer to cover his technical risks. Thus the possibility of raising claims by the engineer would be either directly against the client or against a party in contract with the client, or against the insurer in case the need rises to claim against him. The engineer could as well be in a defending position against claims by the client or through the client by a party in contract with the client, or by the insurer.

**iii) The Quantity Surveyor (QS).**

This professional plays an important role in the British construction system. His duties are to prepare the bills of quantities and to take the

necessary measurements of work during construction. He also caters for the study of claims filed against the client. In other systems, his duties are covered by other professionals. When discussing quantity surveyors' powers, Powell Smith and Sims (1988) state that the powers of the quantity survey or are similarly limited to those expressly conferred upon him by the terms of the contract. Under the JCT Standard Forms these powers generally consist of the valuation of variations, valuation of work done for interim payment (1980 Edition only), and the ascertainment of any direct loss and/or expense incurred by the contractor where, under the relevant clauses, the architect instructs him so to do. Powel Smith and Sims (op cit) explain the function of the quantity surveyor, saying that by clause 13.4.1, (JCT) all variation and all work executed by the contractor in accordance with the architect's instructions for the expenditure of provisional sums shall be valued by the quantity surveyor whose name appears in the Articles of Agreement. Unless the employer and the contractor otherwise agree, therefore, it is solely the responsibility of the quantity surveyor to determine the price to be paid or allowed in respect of a variation. The architect has no authority to determine it or influence in any way that determination. It follows that if the architect were to include, in an instruction requiring a variation, any purported instructions as to how it should be valued 'such as day work', this would be of no effect and the quantity surveyor not only should, but must ignore it and use his own judgment as to the manner in which the work should be valued under the terms of the contract. About the architect they add that he also has no authority to accept a quotation from the contractor in respect of work which is ordered as a variation to the contract; neither has the quantity surveyor, since his function is to value the work in the manner laid down in the contract, which gives him no discretion in this respect. The clause provides that the quantity surveyor is to value the

work in accordance with the provisions of clause 13.5 unless otherwise agreed by the employer and the contractor, who - as the parties to the contract - may, of course, agree any variation to its terms they wish. The QS enters into contract with the client to furnish these services. No other contractual relationship binds the QS with any other party involved in the construction process, save for the insurer. Therefore this professional has the possibility of raising claims against either the client (or a party in contract with the client) or the insurer. He would as well be susceptible to claims filed against him by either or both parties, the client and the insurer. When discussing the relative functions of architect and quantity surveyor, Powell -Smith and Sims (1988) state that the provisions for the valuation of variations now set out in clause 13 of JCT 80 and clause 3.7 of IFC 84, as compared with those in clause 11 of JCT 63, have, among other things, the advantage of clearly defining the relative responsibilities of architect and quantity surveyor in respect of variations. It is clear that, once the architect has issued an instruction requiring a variation or requiring the contractor to carry out work against a provisional sum, responsibility for defending the financial effects of the work covered by the instruction now passes entirely to the quantity surveyor, whose valuation will be required to cover all the effects of the variation up to the point at which it becomes necessary for the contractor to make an application to the architect stating that the introduction of the work in question has affected or is likely to affect the regular progress of the works in some material respect. About the architect they argue that at that point responsibility passes back to the architect. It is he who bears the responsibility for determining questions concerning the progress of the works and, although the quantity surveyor may be brought into the matter again when ascertainment of the resulting direct loss and/or expense becomes necessary, this will only be at the discretion of the architect who

still bears primary responsibility for that aspect. Hughes and Barber (1992) discussed the role of each professional in addressing claims by stating that the role of the architect (A), engineer (E) or quantity surveyor (QS) in adjudicating on claims is rather different from the role of a judge or arbitrator. The A/E/QS has the duty to collect and agree relevant facts on behalf of the employer, and to consider what arguments are available against the contractor's claim, before he can adjudicate. Also unlike the arbitrator or judge, the claim may involve his own acts or omissions.

### 2.1.1.3) Contractor's Group

This is a group of different trades working together to construct the project. Their collaboration is essential for a smooth and successful relation and job completion.

#### i) The Main Contractor

Discussing the different types of contracts, Haswell and de Silva (1900) explain that civil engineering work is usually executed under a contract entered into between the employer and a contractor. Contracts may be classified as follows:

(a) Admeasurement contracts, including
  (i) Bill of Quantities, or
  (ii) Schedule of Rates

(b) Lump-Sum contracts

(c) Cost Reimbursement Contracts
  (i) Cost plus percentage fee, or
  (ii) Cost plus fixed fee, or
  (iii) Cost plus fluctuating fee

(Application of a target may be made to the above when the contract is termed 'target contract'.)

(d) All-in Contracts (also called 'package' or 'turnkey' Contracts,

combining design with construction). The All-in contract is basically a lump-sum contract.

The main contractor could be a small, medium or large company with enough capabilities (financial ,technical, administrative) to complete the required job within the specified time and according to the work specification. Sawyer (1985) says that a large enterprise can be undertaken by a single company, or, where more suitable, by a Joint Venture, a legal joining together of two or more companies for the purpose of constructing the works. The companies in the Joint Venture are jointly and severally bound to execute the works and in the event of one going into liquidation, then the other party or parties to the Joint Venture are obliged to continue the work unless they all, in turn, enter into liquidation. He adds that where the Works are of a particularly large, or of a more specialized nature, a consortium of contractors, each a specialist in his own particular field of work is formed, for example a new steel work might require a separate contractor for the Civil Works. The contractor enters into contract with the client to construct the project. Most main contractors will need other specialized contractors to perform parts of the job either more efficiently, in less time or cheaper than the main contractor will do. In some cases the main contractor does not have the necessary technical capabilities to perform such parts of the work. Here comes the role of the sub-contractor who will enter into contract with the main contractor to perform a specialized job. When a particular sub-contractor is specified in the contract by the client, this will be a nominated sub-contractor. The latter will enter into contract with the main contractor for that part of the job for which he is qualified and specified. The contractor will need different materials, machinery, equipment and fittings, for which he will turn to different suppliers of such items. The contractor will enter into contract with as many suppliers as will the

satisfactory completion of the job requires. If material, machinery, equipment and/or fittings are to be shipped locally, nationally or internationally through the contractor himself and not through the supplier, then the former will enter into contractual agreement with a shipper to render the shipping service. A main contractor will seek insurance of different items during the construction period; for machinery, equipment, against fire, acts of God, man-made causes, theft and others. By buying policies he enters into contract with the insurer. Other financial services are catered for by a bank who furnishes the necessary funds for purchasing materials and running the construction project. Although a direct working relationship exists between the contractor and the professionals involved in the project, yet no contractual relation binds the contractor with any of them. As such, the possibilities for a main contractor to raise claims is against the client, sub-contractor, nominated sub-contractor, supplier, shipper, insurer and banker. Obvious enough he might be the defendant against claims rising from some or all of the above mentioned parties. In case a main contractor needs to claim against any of the professionals working for the client, namely the architect, engineer, construction manager, project manager and quantity surveyor, he will have to file the claim against the client with whom he and those professionals are contractually bound. The same would apply if any of these professionals needs to claim against the contractor. The contractor could be personally involved in these claims by or against him, as well as being represented by a lawyer, representative, site engineer or other.

**ii) The sub-contractor**

This could be a small, medium or large company specializing in one or more trades and has the necessary capabilities to perform that part

of the construction process for which it is contracted. Discussing the appointment of a nominated sub-contractor, Sawyer (1985) sees that it could be one of personal selection by the employer or the engineer and recognized by the contractor when signing the contract. He adds that likewise, unless the contractor raises reasonable objections against such a sub-contractor at the time of nomination or unless he could not get the nominated sub-contractor to enter into a sub contract under the same conditions which the contractor has entered into with the employer, then he must accept such nominations as made by the employer or the engineer. Technical and financial competence are main requirements in a sub contractor, who will generally enter into contract with a main contractor. Other procurement methods will necessitate that a sub-contractor enters into contractual relationships with the client directly or through the construction manager. A sub-contractor could need to buy material, machinery, equipment and/or fittings and would contract different suppliers to furnish it to him. This is another contractual relationship into which a sub-contractor would enter. Shipping as well is an option of getting in contract with shippers to deliver to the site all purchased material, machinery, equipment and fittings. The sub-contractor could, if he wants to, sub-contract a part of his job to other sub-contractors if it is necessary or if he sees that appropriate. Insurance is another contractual relationship which a sub-contractor will enter into when he buys insurance policies to cover the same risks as with the main contractor. A banker will still provide financial services to the sub-contractor to run his project and finance purchase of material and equipment, thus adding another contractual possibility. Thus a sub contractor has the possibility of claiming against the main contractor, his own sub-contractor, a supplier, shipper, insurer or banker. There will also be a possibility of claiming against the client depending on the

procurement method. As is the case with others, this sub-contractor could as well be the defendant against claims arising by the same parties he could claim against. Working relationships with the professionals working for the project is an every day must, yet, as with the main contractor's case, no contractual relationship binds any of these professionals with the sub-contractor. In case the sub-contractor needs to file a claim against any of these professionals, he has to claim against the main contractor (who is in contract with the sub-contractor) who will in turn claim against the client (with whom he is in contract), then the client will claim against the professional. The same process will be reversed if a professional needs to claim against the sub-contractor. In the case of the sub-contractor wanting to claim against the client or vise-versa; both parties would do so by claiming against the main contractor.

**iii) The Supplier**

Depending on the procurement method followed in any project, the supplier could be in contractual relationship with either the client or the main contractor. In any case he would be also in contract with the subcontractor. If shipping and delivery is included in the supply agreement, then the supplier would be in contract with the shipper too. A supplier would seek insurance through an insurer, and could seek financial services from a banker, thus increasing the parties with which he got into contract. This supplier could claim against the client, main contractor, sub-contractor, shipper, insurer and banker. He could also be confronting claims from these same parties. In the case of a supplier claiming against any party with which he is not bound by contract, he should do so by claiming to the party with which they both have a contractual relationship.

**iv) The shipper**

This is any group of service businesses that will transport goods necessary for the construction of the project. This could be locally, nationally or internationally. Transport could be by air, sea or land transport. A shipper is not directly involved in the construction process, yet renders vital services to it. Procurement methods could lead to a direct relationship between the shipper and the client. Other direct relationships would be with the main contractor, sub-contractor and supplier .A shipper has to have insurance policies with an insurer, and may seek financial aid through a banker. Claims possibility by the shipper would be against the client, main contractor, sub-contractor, supplier, insurer and banker. He could be claimed against by these same parties too.

**2.1.1.4) Others**

Numerous parties could be involved in a claim on a certain construction project, depending on the surrounding circumstances, site, country legislation and economic environment. These parties are not directly or indirectly involved in the construction process, yet they affect and are affected by the project through the general environment of the construction industry. The parties mentioned hereafter all share one common characteristic; they mostly take the initiative of claiming against the parties mentioned in the construction group. They are mostly claimants, yet still could be on the other side of a claim, posing as the defendant.

**i) Ecological/ Environmental Agencies:**

These are public or private organizations involved with the conservation of the natural resources, and lobbying for a cleaner

atmosphere. The construction industry could be a target for these organizations if it does not conform to their standards. To what extent have these environmental organizations succeeded in enforcing their standards on the construction industry is still to be monitored. Attack on the industry could be twofold. The construction process would come under fire if non-environmental friendly materials are used to construct the project, or if the construction methods used could have a negative impact on the environment, including disposal of waste material. The other possibility being that the project itself, when completed would be a threat to the surroundings, either through the waste disposal methods, the waste material itself, heat or waves generated during operation, or the end product it will produce, in case it is a manufacturing plant. Before construction ever begins, there could be a protest by these agencies to choosing of a site for ecological reasons. The threat they will argue could be to flora, fauna, or man. Many a party could come under fire from these agencies. The client could be the first to be claimed against, followed by the architect, contractor, sub-contractor, supplier or financier. Public bodies issuing building permits could be claimed against too. Any of the above mentioned parties, if negatively affected by the environmental agencies could claim against them as well.

**ii) Third Parties**

This is a group which is not part of the construction process but could be negatively affected by the process. They include:

**iii) Neighbours**

These could be the direct neighbours of the construction site or distant ones and affected by either the construction process in itself, the operation of the project after completion, or basically the presence

of the project. The affected neighbours could be a minority or majority group; e.g. children, the elderly and soforth. The effect on them could be daily, part of the day, weekly, monthly or seasonally. These effects could be serious, or just disputed ones. These neighbours could claim against the client (owner), the architect, the contractor, the sub-contractor, or even against the public bodies giving licenses for construction to these parties. Conversely, these neighbours could be claimed against, mainly by the client and the contractor.

**iv) The community:**

This comprises the bigger number of neighbours around a certain construction project. These too could be affected and can, as a group, claim against the client, architect, contractor and sub contractor. These neighbours, united as a community, could more easily claim against the public bodies issuing licenses or permits of construction. The community, as with the neighbours, could move its claims if all or part of its members are affected by the project for part of or all the time. This party could be the defendant against claims from those parties affected by its positions, mainly the client, the contractor and the sub-contractor.

**2.1.1.5) Lobby Groups:**

These are usually societies, associations, clubs and the like, that work mainly on the national or international scale, yet could be involved in local matters. These groups are organized and are used to lobbying in favour of their goals. With usually educated membership, these groups could be a real threat to their targets. A group would normally defend its members, the community or the society against what contradicts with its beliefs or benefits. Here are some examples:

**i) Archaeological Groups:**

These are occupied with searching for, maintaining and improving archaeological sites. If a construction project poses any threat to their work, they will (and do) claim against whoever they find involved in this threat. Their target could be the client, architect, contractor, sub-contractor or the public body licensing for such projects.

**ii) Religious Groups:**

These could represent the majority or a minority of the people who work for the spread of their religious belief and maintain regular services to their members. These could be local, national or international groups.

**iii) Moral/Ethical groups:**

These are occupied with defending and/or spreading moral and ethical principles. Certain projects could trigger their uprise and so they could claim against those threatening their interests.

**iv) Economic Groups:**

These would lobby for the interest and goals of their members, or for the society and nation if a certain construction project could be a threat to their goals, they would certainly claim against whatever party they find threatening their goals. All these lobby groups could find their target in the client, contractor, sub-contractor or the public bodies licensing for such projects. These claims can backfire on the lobby groups who could find themselves as defendants against claims filed by those same targets.

**2.2) Notice**

When discussing clause 67 of FIDIC relating to claims, Duncan Wallace (1988) / stated that typically, its draftsmanship is unnecessarily complicated and in places obscure, but its scheme appears to be as follows:

(a) It contemplates a preliminary ("in the first place") reference of all disputes to the Engineer for a decision by him within 90 days.

(b) That decision is to be final and binding on the parties until the completion of the work or subject to the Arbitration provided for in the Clause.

(c) If "no claim to arbitration has been communicated" to the engineer by either party within 90 days of its notification, the decision "shall remain final and binding upon the employer and the contractor. "(The clear implication is that if a "claim to arbitration" has been communicated, the decision ceases to be final and binding).

(d) A further 90 days period is allowed if the engineer gives no decision within the first 90 days after the request, in which event either party "may require that the matter in dispute be referred to arbitration as hereinafter provided" (in such a "no decision" case the wording does not require the claim to arbitration to be "communicated to the Engineer"). The clause is silent as to the person who is to be the recipient of the "requirement for the dispute to be referred to arbitration," which applies both in "decision" and "no decision" cases.

(e) All disputes where "the decision (if any) has not become final and binding" shall be finally settled under the Rules of arbitration of the ICC by one or more arbitrators appointed under those rules".

(f) In the case of the Second Edition, the arbitrators are not to "enter on the reference" until after completion. In the case of the Third

Edition, "the reference to Arbitration may proceed" at any time, in contrast to the Second Edition.

Franks (1984) addressed the topic of delays and the necessity of a written notice from the contractor by saying that clause 25.2.1.1 of (standard form) SF 80 requires that if it becomes reasonably apparent that the progress of the works is being or is likely to be delayed, the contractor shall give written notice to the architect of the "material circumstances including the cause or causes of the delay and identify in such notice any event which (in his opinion) is a Relevant Event". Where the material circumstances in the written notice include reference to a nominated sub-contractor, the contractor is required to send a copy of the notice to the nominated sub-contractor. The contractor's written notice should include particulars of the expected effects of the relevant event to which he refers in his notice and he should also estimate the extent of the expected delay in the completion of the works beyond the completion date. If it is not practicable for the contractor to give the above particulars at the time he gives his written notice, he is required to do so as soon as possible after the notice and he is also required to send topics of the particulars to nominated sub-contractors. Franks (op cit) also states that having received from the contractor any notices and particulars and estimates, the architect is obliged to decide if, in his opinion, any of the events stated by the contractor to be the cause of the delay is a relevant event and if the completion of the work is likely to be delayed by it. If so, the architect is obliged to give the contractor, in writing, an extension of time by fixing such later date as the completion date as he, the architect estimates to be fair and reasonable. In his letter to the contractor the architect is obliged to state which of the relevant events he has taken into account and the extent to which he has had regard to any instruction which he may have

given which required (as a variation) the omission of any work issued since the fixing of the previous completion date. About the action, Franks said that the architect is required to take the action described above within twelve weeks from receipt of the notice, particulars, etc. from the contractor or, if the completion date is less than twelve weeks away, the architect must act before the completion date. Thomas (1993) discussed the "notice" by saying that most building and civil engineering contracts contain provisions which require the contractor to give notice of delay of its intention to claim additional payment under the terms of the contract. It is usual for the contract to specify that notice should be given within a reasonable time, but other terms such as "forthwith", or "without delay" or within a specified period of the event or circumstance causing delay or giving rise to the claim may be used. The course has had to consider the meanings of various terms and they have often been faced with the argument that the giving of notice was a condition precedent to the contractor's rights under the contract. The ICE conditions of contract generally opt for specified period within which notice should be given. A case involving the ICE conditions of contract and helpful in deciding if notice is a condition precedent was *Tersons Ltd. v. Stevenage Development Corp.* Duncan Wallace (op cit) discussed the subject of the failure to give notice by stating that in principle there is no general rule or requirement for notice of default to be given by an owner to a bondsman or guarantor, unless the bond or guarantee so stipulates. Whether, in that event, notice would be condition precedent to the surety's liability, would be a matter of construction of the bond. Normally in the law of contract, failure to comply with a requirement of notice will in the absence of express provision or necessary implication, only give rise to a liability in damages, like any other breach. It may be speculated, perhaps, that in those cases where a bondsman is expressly given power to take over the

work from a defaulting contractor, a more strict interpretation might be placed upon a notice requirement. But it would in fact be an extremely badly-advised owner who would agree to such power, since a bondsman's only interest will be to complete at the lowest possible cost, unlike a solvent contractor with a commercial reputation to safeguard. Such a power he said is directly contrary to the express policy of the great majority of construction contracts, which not only prohibit "assignment" or vicarious performance of the contract without consent, but also often enable the contract to be terminated upon insolvency, thereby preventing any receiver or liquidator or trustee from seeking to complete the contract without the consent of the owner. Nevertheless, Duncan warns that perhaps because of the apathy or inexperience of owners' advisers, modern bondsmen still succeed in inserting notice requirements into bonds, well aware that, in the probable circumstances of most construction contracts prior to a contractor's default, many earlier indications of actual or potential defaults will have occurred from time to time, thus affording a defense that notice under the bond should have been given earlier. Thomas (op cit) said that whilst failure to give notice of delay for extensions of time is not usually fatal to a claim ,failure to give notice in accordance with the contact with respect to additional payment may bar, or severely prejudice a claim. He added that there are good reasons for contracts to have provisions for the contractor to give notice. No employer will wish to have a substantial claim appearing "out of the blue" at the end of a contract. *(J. and J.C.A. Abrahams v. Ancliffe {1938}* 2 NZLR 420,). In *Crosby v. Portland UDC*, the works were suspended by order of the engineer and the contractor did not give notice with a period specified in sub-clause 40(1) of the fourth edition of the ICE conditions of contract which contained the proviso "provided that the contractor shall not be entitled to recover any extra cost unless he gives

written notice of his intention to claim to the Engineer within twenty eight days of the Engineer's order'. It was held that since the contractor had not given notice within the specified period, the claim failed. When addressing the extension of time claims, Thomas (op cit) said that most contracts do not require the contractor to do more than give notice of delay, maintain records and provide particulars and that notice provisions vary. Some examples are:

The JCT80 has the provision that whenever it becomes reasonably apparent that the progress of the Works is being or is likely to be delayed the contractor shall forthwith give written notice.

The GC/Works/1, Edition 3: Notice may be given at any time, but not after completion of the Works. Clause 35 contemplates regular review of extensions of time,

The ICE fifth edition states that full and detailed particulars shall be given within 28 days after the cause of the delay has arisen or as soon thereafter as is reasonable in all the circumstances. (Clause 44(1)). Similar provisions appear in the sixth edition.

The JCT80 goes on to require the contractor to give particulars of the expected effects of the delay and an estimate of the extent of any delay in completion of the works beyond the completion date. The GC/Works/1 requires the contractor to keep records (Clause 25).

Under the ICE Conditions of Contract a contractual claim may be submitted to the engineer at any time during the currency of the Contract and until three months after the date of the Maintenance Certificate issued by the engineer, as per Haswell and De Silva (1982).

Thomas (op cit) added that where minutes of meeting are

inaccurate, or where there are important omissions, it is essential that these are brought to the attention of the attendees and the necessary correction made. Matters which require immediate attention should be dealt with in writing before the next meeting. Failure to follow these procedures causes major difficulties when trying to establish facts several years after the event. It is not unusual, when interviewing material witnesses in preparation for arbitration ,to be told that the minutes of meetings did not record what was agreed. Even if it is possible to verify such allegations, it is sometimes difficult to reconstruct the history of events. On monitoring claims Thomas said that once delay has occurred which affects any important activities, it is essential that the effects of the delay are monitored, and that the programme is immediately updated to show the effects of the delay. If actual progress is monitored against a programme which is no longer valid, it is difficult, or even impossible, to establish the effects of particular delaying matter on the overall programme and completion date. All progress, and delays, should be monitored against a programme which represents the contractor's proposed "programme of the day" that is, a programme which has been revised to take account of all previous delays. He added that many delay claims by contractors fail due to lack of notice and/or failure to justify any (or sufficient) extension of time, or additional payment ,due to lack of records. No truer comment he said had been made than that made by Max W. Abrahamson in his book *Engineering Law and the I. C.E Contracts, fourth edition at page 443;* quote: "A party to a dispute, particularly if there is arbitration, will learn three lessons (often too late): the importance of records, the importance of records and the importance of records." On the importance of records he said that having given notice, the contractor should keep contemporary records in order to illustrate the effects of the events, or circumstances, for which notice has been given.

The recipient (the architect, or engineer) should also keep contemporary records. It is good practice to agree what records should be kept, to jointly monitor events and to agree facts during the progress of the works. Many contracts now contain express provisions of keeping records. On the notice to claim Thomas (op cit) said that most contractors do give notice of their intention to claim at some time during the contract. Some avoid any indication at all of their intention to claim until after an extension of time has been made. The former may barely comply with the contract and may prejudice the contractors' entitlements to some extent. The latter will invariably be the beginning of an uphill struggle to obtain payment of substantially less (if anything at all) than might otherwise have been possible if the contractor had given prompt notice. Notice provisions in modern construction contracts vary considerably:
Thomas noted that:

*In JCT8O - Clause 26.1.1 merely requires the contractor to make an application" ... as soon as it has become, or should reasonably have become, apparent to him that the regular progress of the works or of any part thereof has been or was likely to be affected {by the matters referred to } . .." . It may be difficult to decide whether or not an application is late in all the circumstances. The only significant difference, Thomas said, between the present clause and its predecessor {JCT63} is the addition of the words' ... 'or should reasonably have become {apparent}...'. The clause lacks, in Thomas' opinion, express language to bar a claim if an application is made "late."

* In GC/Works/l, Edition 3 - Clause 46 (3) states that the contract sum shall not be increased unless' (a) the contractor, immediately upon becoming aware that the regular progress of the works or any part of them has been or is likely to be disrupted or prolonged has given notice to the

(Project manager) specifying the circumstances causing or expected to cause that disruption or prolongation and stating that he is, or expects to be, entitled to an increase in the contract sum.'...

- The ICE fifth edition - Clause 52(4) requires the contractor to "...give notice in writing of his intention {to claim} to the engineer as soon as reasonably possible after the happening of the events giving rise to the claim." The sixth edition introduces a twenty-eight day period after the event giving rise to the claim has arisen, but like the fifth edition, if the contractor fails to comply with the contractual provisions, the contractor is entitled to payment so far as the engineer has been prevented from investigating the claim.

Whatever form of Contract is adopted, as per Haswell and De Silva (op cit), a claim, when it occurs, has to be notified to the engineer at the appropriate time for such a claim to have a chance of success. In the ICE Conditions of Contract the manner in which the notification of a claim is to be lodged and the procedure relating thereto is dealt with in six paragraphs of sub-clause 52(4). From a point of contractual claims this clause ranks high in importance to a contractor. They see that clause 12(1) of the Conditions of Contract deals *inter alia* with the method of notifying a claim under this clause and that it requires that:

(a) The notice of an intention to claim be given to the engineer under Clause (52)4 of the Conditions of Contract.

(b) The contractor specifies in the notice the physical condition or artificial obstructions encountered.

(c) With the notice, if practicable, or as soon as possible thereafter, details of the anticipated effects, the measures that are being taken or proposed to be taken and the extent of the anticipated

delay in, or interference with, the execution of the Works are required to be furnished.

Hughes and Barber (1992) mentioned that notification can lead to mitigation of the effects of the event or circumstances, it is also a cue for extra records to be kept and agreed. The giving of timely notice is commonly stipulated to be a pre condition to entitlement (or failure to do so a reason for partial disentitlement) to ensure both that the opportunity for mitigation is not missed and that records are kept. They warned that not every claim that is notified is valid and that stimulus to submit a claim may be a perceived imbalance, a shortfall in income or an overspend in costs - indicating a 'need' to claim. They added that it is not, however, a necessary criterion for entitlement under the contract that the contractor should have suffered a shortfall, nor is suffering a shortfall, of itself grounds for extra entitlement, although it may seem to provide 'moral' grounds for claiming. Hughes and Barber (op cit) emphasise that the contractor must give notice of an intention to claim as soon as possible and that what this means is not always easy to define, the point being: when does the claim arise, or rather when does the necessity to enter a claim become apparent? They said that Conditions of Contract in the past have attempted to stipulate that notice shall be given immediately upon the happening of the event giving rise to the claim. ICE 4 was penal in this connection, particularly as regards to Clause 12 which stipulated that 'the cost of all work done or Constructional Plant used by the contractor prior to giving such notice shall be deemed to have been covered in the rates and prices. They concluded that the conditions of contract all seem to recognise that a claim situation does not occur at a clearly defined point in time and is not always instantly recognised .Notices of intention to claim are amongst the many other notices required from the contractor. It follows, however, that if the contractor is required to give notice, with

the implication, if not the express statement that failure to do so may damage or preclude his entitlement, then neither the architect, engineer nor quantity surveyor is entitled to complain or criticise if the contractor does as he is required. Hughes and Barber added that where a contractor fails to give notice because the matter has not become apparent earlier, then the conditions must be examined to establish whether or not he is entitled to claim and that the general case is that he would be. For claims not based on provisions within the contract, ie for damages in breach, Hughes and Barber (op cit) state that there is no time on notification beyond that imposed by the Limitation Act (1980) (6 years for simple contracts and 12 years for contracts under seal). With the passage of time facts become more difficult to establish and their effect on work long completed more so. As a generalisation they concluded it may be said that a contractor can legally recover only what he can prove.

## 2.3) Preparation

### i) Party preparing

Wood (op cit) warned of practitioners who declare that they are claim specialists. They may have their uses but there is a tendency for some of them to have a repertoire of claims which are trotted out in the same old form time and time again on different contracts irrespective of actual environmental circumstances and then they seem amazed that Architects or Engineers are wary of treating their claims seriously. In Wood's opinion a surveyor who has been on a contract since its start, attended all the site meetings, ingested the particulars of the correspondence, variations, delays in providing drawings, late instructions, thrashed out the contractual position on controversial matters, listened to the Site Agent or Resident Engineer's point of view, watched the men at work, discussed problems with client's surveyors, and

mastered the fundamentals of the programme, is the man most likely to initiate or originate a claim which will not only be acceptable in principle but stands a good chance of being paid in full. Franks (op cit) stated that the contractor must decide who will prepare the claim. Will it be his own staff or a specialist in such matters?

The larger specialist contractor may well have an accounts or quantity surveying department which has personnel experienced and qualified in the claims field but smaller firms frequently do not have such departments and they must decide whether to arrange for their own staff to find time to take aboard the considerable work commitment involved in claim preparation or to engage a specialist consultant. The preparation of a claim by the contractor's own staff depends on their knowledge and experience and on their available time. If decided to be dealt with in-house, claims are frequently handled by separate departments when the client is a large organization. When discussing the effective use of consultants to prepare a claim, Cushman and Meeker (1989) stated that priorities must be established defining what really needs to be done. A consultant will be best used when its services are directed toward some specific goals. The achievement of these goals should involve the performance of specific tasks which are directly related to the goals. The goal may change over time, so the tasks can be performed in distinct phases. When the tasks they added are clearly defined, the experienced consultant will be in a position to estimate the number of professional hours necessary to perform the job. Thomas (op cit) encourages the hiring of an independent consultant and said that even if the contractor is right, it is important to search for alternative arguments and means of persuasion. This is usually difficult to achieve by staff who have lived with the project and have fixed ideas on what happened and who were to

blame. In any event, it is good practice to get an independent view of strengths and weaknesses of the claim, the likely range of settlement, or award, and expert advice on how it should be presented before any submission is finalized for dispatch to the opposition. If there is any potential liability for liquidated or general damages, this should be brought to the attention of management and taken into account in the overall assessment of the likely recovery. Thomas added that many contractors have the resources and capability to prepare their own claims. However, even the best organised contractors (including those who are recognised as being amongst the leading companies in the industry) are often unable to make the most of their case in a written submission. Whilst a poor claim cannot be made into a good one, a good claim can easily fail if it is presented badly. He stressed that many good claims fail, at least in part, because the author of the claim is influenced by staff in the company who have vested interests in overlooking any shortcomings in the contractor's case and perhaps by placing too much emphasis on elements of the claim which have caused dispute throughout the contract. The reason, in his opinion, is that if the contractor's staff has been advising management that the claim is well founded and worth several hundred thousand pounds, they will be reluctant to change their view even in the light of valid counter arguments put forward by the other side.

**ii) Method of preparation**

The first step in preparing a claim as Wood (op cit) put it is to determine under which Contractual Clause(s) the claim is to be notified and under which Clause the payment is to be sought (if different from the former Clause). The preparation of a claim requires the marshaling of all facts and evidence in order to substantiate any and all statements made in connection with it. The main points of a claim should be readily derived

from prima fascia evidence found in or from among the following documents and data:

Contract and contract correspondence.

Drawings (revised and record)

Notes

Site Costing and Finance.

Site Photographs

Schedules.

Site meeting minutes.

Claim Documentation (including notification).

Errors (in Bills of Quantities., drawings and specifications)

Number and magnitude of Variations.

Correspondence concerning Nominated Sub-contractors and/or Suppliers.

Wood stressed the importance of paying strict attention to the smallest details while preparing a claim. Thomas (op cit) gives the person (or persons) responsibility for preparing the claim some guidelines. Here are some:

i) Establish the basis and quantum of claim which is considered to be correct in all respects. This will take into account all of the facts and particulars which are available and reasonable assumptions where they are necessary.

ii) The lowest and highest sums which are likely to be awarded if the matter should proceed to arbitration should be considered.

iii) Claims which are based on a logical analysis, where cause and effect are established, will be at the high end of the probability scale, yet claims which tend to be based on a global assessment will normally be at the lower end of the probability scale.

iv) Having established the likely range of success of the 'real' claim, it will be necessary to decide how, and to what extent, the negotiating margin can be settled.

Thomas sums up his advice to contractors by saying that every 'grey area' must be presented as black or white, depending on the circumstances. Care should be taken to avoid presenting black as white. Under no circumstances should contemporary records be changed, or invented, in order to distort the truth. Dishonesty should be avoided at all costs. The contractor, or subcontractor, submitting the claim should be aware of the probable range of success, the nature and quantum of the negotiating margin and the strengths and weaknesses of the claim before submission. Any elements which cannot be argued with at least some degree of conviction may have to be discarded. Wood (op cit) put a principle for surveyors working full time on a contract and responsible for claims, to walk around the site (or as much of it as possible) each day and observe what is happening on the contract. This principle works best based on the following well known three axioms used in investigative procedures:

(i) Observation and contemplation of any possible problems.
(ii) Research and investigation of the cause of problems.
(iii) Interviewing and consultation as to the final situation and rights of the parties.

Contractual claims in Wood's opinion are not the panacea of all financial ills but they can assist in ensuring that the fullest payment possible is made on a contract, and before further examination of them it must be appreciated that half the battle is in preparing a Final Account to try and make certain that the contractor is paid all the things he has done and to which he is entitled under the contract terms. In over-valuation of a

claim, Thomas (op cit) said that whatever the standard of records and management accounts, even if it is possible to calculate, with precision the correct amount of the claim, it is a fact of life that the claim is unlikely to be paid in full. For this reason, even the most professionally prepared claim will include a measure of over-valuation as a negotiating margin. Thomas warns that the first submission of a claim requires very careful planning and that it must not contain any information, assumptions or calculations which can be used against the party submitting the claim. Several alternative approaches may be necessary in order to establish which is the best and most persuasive presentation. It is important to carry out several crosschecks to ensure that the financial data and assumptions can stand up to scrutiny by the recipient. Thomas adds that if there is an element in the claim which is found to be dishonest, then the remainder of the claim, no matter how well founded, is likely to be treated with extra caution, which it deserves.

Kartam (1999) states that the claims' log will list all of claims made on the project along with their status. It will show the amount of the claim, the time extension requested, if any, and the file number where to allocate all of the information related to this claim issue. Usually, a claim will be proceeded by a history of correspondence that took place and were unsuccessfully resolved. It is important to keep all of this information on file.

Kartam added that The first task a delay claim analyst should perform particularly if he/she is new to the project, is getting acquainted with all of the project documents. Reading and understanding the history of what happened, when it happened, and how it happened is crucial basic information that the analyst should start with. These documents represent facts that the analyst should be able to obtain.

**iii) Fees or Cost**

Frank's (op cit) idea is that cost of preparation is high regardless of whether the contractor's own staff or a consultant undertakes the work. If however, the contractor's staff are working at less than their potential capacity, in-house preparation may be more economical provided the expertise is comparable with that which should be obtained from a consultant. Frank discussed the subject by saying that a consultant will often give an estimate of his fee for making an initial examination of the papers and advising the contractor regarding his case. Having ascertained the strength of the case, he may offer to prepare the claim, on a 'percentage of costs recovered', on 'a daily rate' or a 'lump- sum fee' basis. The 'percentage of costs recovered ' basis is probably the most positive for the contractor but consultants will not usually work on this basis unless they consider the contractor's case to be good and the sums involved are sufficiently high. A "lump-sum fee" estimate ensures that the contractor knows the extent of his commitment but consultants may pitch their estimates high because it is difficult for them to assess the extent of their work in advance. Whilst most consultants will wish to take over the whole of the papers and do all the work within their own offices and employing their own staff a few will work with the contractor's staff in an advisory capacity. In this event the contractor undertakes much of the routine 'searching' with his own staff and assembles the information under the guidance of the consultant who is then able to interpret it and draft the claim. The largely routine clerical work, photocopying and assembly can usually be accommodated by the contractor. Thus keeping the consultant's fees lower. When discussing the cost of preparation Thomas (op cit) said that in the vast majority of cases, the cost of preparing the claim is not a recoverable cost. However, there are

circumstances in which the cost of preparing claims may be recovered, and these are:

1) if each claim is prepared by the contractor's staff, as and when they arise during the contract, the salaries and other costs of the staff will usually be included in the head office overhead and may therefore be included in the general claim for prolongation;
2) If in spite of all requests for an assessment of the amount of the claim (and provided that the contractor has provided all particulars in accordance with the contract) no assessment is made within a reasonable time, the contractor would be justified in preparing his own claim and may be entitled to reimbursement - see *James Longley & Co. Ltd v. South West Regional Health Authority (1983).* The costs of preparing a final account may be recovered as damages in a suitable case, eg for breach of an obligation on the part of an employer to provide a final account...' This may include the contractor's own managerial time (provided that it is not included in overheads), *Tate & Lyle Food Distribution Ltd v. GLC.*
3) Where certain work is done in connection with preparing a case for arbitration, *James Longley v. South West Regional Health Authority*, the cost of preparing unnecessary evidence may not be allowed.

Haswell and De Silva's (op cit) opinion is that the arbitrator has full discretion as to the costs of the reference since the arbitration clause expresses no contrary intention. There is no distinction between the costs of the award and the costs of the reference. The term 'costs of the reference' includes all the expenses properly incurred by the parties before and during the course of the hearing before the arbitrator. The

arbitrator has full power to deal with the costs and indeed this he must do in his award except in the case where the parties to a reference have agreed as to who shall pay the costs and have so informed the arbitrator. Although in general terms the costs follow the event, experience in arbitration has shown that the legal view in the awarding of costs is somewhat complicated from the point of view of the civil engineering arbitrator.

**2.4) Format**

The format of a claim as Franks (1984) stated will depend to a considerable extent on its size and complexity but for the majority of contractor's claims the principal headings may be:

(a) Contract particulars;

(b) Statement of event leading to claim;

(c) Statement of claim;

He explained the contract particulars by saying that these should identify the following:

i. the title of the project;

ii. the parties to main contract and sub-contract (client, architect, main contractor, quantity surveyor, other consultants, and sub-contractor);

iii. the tender;

iv. specifications or bills of quantities;

v. drawings, with details of numbers and revision letters;

vi. articles of agreement.

Relevant dates and significant details should be given. Franks(op cit) further explained the statement of events leading to claim by stating that this statement will probably open with a common theme indicating the manner in which the project progressed and the 'communication gap'

widened. To facilitate cross- referencing the statement should be itemized. Dates and sources of information should be given. When the common theme has been established the contractor is able to record the events related to individual items. The statement of events should provide irrefutable evidence of the disruption (delay or whatever) which the contractor has experienced so that a succinct 'statement of claim' may be prepared. Reg Thomas (op cit) stated the main points to be included in a formal claim, which are:

1) Contract particulars
2) Summary of facts
3) Basis of claim
4) Details of claim
5) Evaluation of claim
6) Statement of claim
7) Appendices

Stephenson (1993) mentions the "Scott schedule" and that where a claim comprises a large number of items each of which has a separate basis in the contract, it is often convenient for the arbitrator to have the pleadings summarized in the form of a "Scott Schedule", sometimes called an Official Referee's Schedule. Such a schedule usually requires preparation by both parties, and does not have any fixed format, other than the basic principle that each item is taken separately, and includes the contentions of both parties in relation of that item. Wood's (1978) advice on the matter of format is that when finally presenting the claim for consideration it is essential to pay attention to the format and manner in which the claim is submitted. If a large number of copies are required and perhaps because there is strong likelihood of the claim reaching the law courts, the document could be printed with thick cardboard covers. Advising contractors, Wood asks them to avoid supplying a badly written

document with numerous alterations and "crossings out" since nothing destroys confidence so much as a claim carelessly presented and the architect or engineer might really take the view that the claim is not worth the paper it is written on. He added that it usually assists to have synopsis of the Contract Particulars together with any pertinent case history and/or notes. If the Architect and Engineer can easily grasp the situation, readily see the grounds for the claim, and the obvious contractual liability for payment of the claim, then the task of settlement is likely to be much more expeditious and certain. Reg Thomas (op cit) discussed the "Agreed bundles" which after collecting all of the relevant documents, those documents which will be referred to in the hearing are collected and filed in a logical sequence in several bundles. Normally the claimant will prepare the bundles ,and the respondent will be given the opportunity to add further documents. The completed files are known as 'agreed bundles'. Reg Thomas mentioned seven main points to be included in a claim which are:

a) Details of the effects of any delay or disruption on all activities in parallel and subsequent to the circumstances giving rise to the claim;
b) An introduction to the claim giving the contractual provisions under which the claim is being made;
c) A summary of notices and particulars given during the contract;
d) Diagrammatic illustrations where appropriate;
e) References to recognized authorities and case law relied upon;
f) Additional, or alternative claims under the general law (if applicable);
g) A statement setting out the amount of the claim;

For the contractor to ensure that there is a response or some other means of moving forward, Thomas stresses that the covering letter to the submission should summarise the claim so that any person who is not familiar with the detail, and who may be making important decisions, can appreciate the nature and amount of the claim without reading the detailed submission and appendices. The letter should invite a reply within a reasonable specified period. He added that it may be useful to suggest a meeting to discuss and explain the claim in more detail before a formal reply is expected. Thomas (op cit) added that none of the provisions in JCT8O, ICE/5th Ed or GC/works/1 Ed.3 requires the contractor to show the effects of the delay or how it arrived at its estimate of the period of delay. Provided that the contractor has provided details of all events, dates, what work was affected and the like (together with an estimate of the delay in the case of JCT80) it appears that the contractual provisions have been satisfied and the onus is then on the architect, or engineer, to decide what extension is reasonable on the basis of the particulars provided and/or on the basis of further information obtained from other sources. Many contractors only provide information (often insufficient) and rely on the architect, or engineer to make a reasonable extension of time. Thomas advised contractors that the better approach on the part of the contractor is to present his claim for an extension of time showing how he arrived at his estimate of delay and the effects on completion of the works. If the contractor has a detailed critical path programme using one of the well tried software packages or a tailor-made package, then this task can be simplified. Yet he said that carefully prepared linked bar chart programmes can be very effective provided that the original logic is right. Haswell and De Silva's (op cit) opinion is that a fundamental prerequisite for the preparation of a contractual claim is that an entitlement for it should be evident from one or more clauses

incorporated in the Contract. Having identified the relevant clauses it is then necessary to collate all the facts and evidence available to the contractor in support of his claim so as to demonstrate its validity to the engineer. The first step that the contractor has to take when a claim situation arises is to notify the engineer of his intention to claim under the relevant clause or clauses of the Conditions of Contract within the time limits stipulated therein. Brief particulars of the claim should be set out in the notification unless the full and detailed particulars relating to the claim can be sent with it. The comprehensive particulars should be submitted to the engineer as soon as this is practicable and with due regard to the particular requirements of the clauses under which the specific claim is made. Once the principle of the claim has been accepted by the engineer it is necessary to present a fully prepared quantified claim. This would still be necessary even if the engineer did not accept the claim in principle and it is the intention of the contractor to seek a formal decision of the engineer under Clause 66 of the ICE Conditions of Contract or a similar clause in another form of Contract. Should the contractor be dissatisfied with such a decision then the dispute can be referred to arbitration in which event the fully prepared quantified claim will form a part of the Points of Claim prepared for the arbitration. A formal claim has to be set out clearly and be well prepared so that the basis of the claim and the evidence in support of it are presented in a manner that is readily understood by the engineer, or if the need arises by the employer and lawyers. As supporting evidence, a case history of the events leading to the cause of the claim, should be given. The claim should also tabulate and set out the relevant documents, events and technical considerations that the contractor relies upon to prove his entitlement for the claim. The manner in which a claim is presented depends on the type of claim, its magnitude and also on the organisation

and the person or persons responsible for its preparation. A typical claim submission may follow the format set out below:

Title Page

Table of Contents

Part 1: Contract Particulars

Part 2: Claim Particulars

Part 3: Evaluation of Claim

Part 4: Summary

Where appropriate, documents that are relied upon in support of the claim would be attached as appendices. Clause 26.1.1 of JCT8O requires that the contractor's written application should 'be made as soon as it has become, or should reasonably have become, apparent to him that regular progress of the works or part thereof has been or was likely to be materially affected'. Although not specifically referred to, in the case of deferred possession, Powell-Smith and Sims (1988) suggest that an application should be made as soon as notification is received from the employer that possession of the site is to be deferred. The application must, therefore, be made at the earliest possible time and certainly before regular progress of the works is actually affected, unless there are good reasons why the contractor could not foresee that this would be the case. Although Clause 26.1 allows for an application to be made at the time of or after the event, the intention is clearly that the architect should be kept informed at the earliest possible time of all matters likely to affect the progress of work and likely to result in a money claim. Failure to notify the architect in advance, where it is practicable to do so, will deprive him of the opportunity to take any remedial action open to him and the contractor may therefore be under some difficulty in establishing why it was not possible for him to give earlier notice. An early, rather than a late, application is therefore essential to enable the contractor to

demonstrate that he has taken all reasonable steps to mitigate the effect upon progress and the financial consequences. If the architect fails to take advantage of this, then clearly it is his responsibility and not the contractor's when answering to the employer for the extra cost involved. The objective of the whole machinery of application is to bring the architect's attention to the possibility that disruption is likely to occur. Powell-Smith and Sims (op cit) emphasise that the making of a written application by the contractor at the proper time is clearly a condition precedent. In other words, failure by the contractor to apply in writing in the time specified in the contract is fatal to his claim for payment under the contractual machinery. They addressed the nature of application and that it should be in writing, but no particular form is specified. It should state that the contractor has incurred or is likely to incur loss and/or expense arising directly from the deferment of giving possession of the site or the material effect upon the regular progress of the works or any part of the works of one or more of the seven matters listed in Clause 26.2 of the JCT8O contract. It is also advisable, in their opinion, for the contractor to go into a certain amount of detail about the circumstances that have given rise to his application. From the wording of Clause 26.1 it is plain that the contractor need make only one written application in respect of loss and/or expense arising out of the occurrence of any one event. This will entitle him to recover past, present and future loss and/or expense arising from that event, and there is no need to make a series of applications as was the case under the equivalent provisions of JCT 63 as in *FG Minter Ltd v Welsh Health Technical Services Organisation (1980)*. Powell-Smith and Sims warn that a general or protective notice is not sufficient under Clause 26.1 of JCT8O and that specific written applications must be made in respect of each event. Haswell and De Silva (op cit) said, as per the Conditions of ICE Contract, that contractual

claims, being those which arise from specific clauses of the Conditions of Contract, should refer to the clause number(s) under which the claim is made so as to obtain initial acceptance for it.

**2.5) Scale**

**i) Major / Minor Claims:**

Stephenson (op cit) defined small claims as those in which a risk exists that costs may be substantial in relation to the sum in dispute. The objective of procedures designed to deal with such claims is to ensure that costs are not allowed to become disproportionate to the claims; hence the definition is itself flexible. However as a very rough guide it is suggested that any claim amounting to less than six figures is potentially within this definition. Whether it is in the interest of the contractor to present a large claim or it is better for him to present a number of smaller definitive claims, Wood (op cit) recommends a number of well prepared definitive claims and rejects the idea of a large obscure claim and say that this is patently wrong and may only lead to total rejection, because the streamlined single main claim may overlook the individual essentials of the minor claims. He explains that there is a financial logic about a contract which can usually be determined by the Quantity Surveyor and that if the financial claim does not bear out this logic then doubts are raised in the minds of those settling the claim. Once doubts are raised it is a much more difficult thing to allay them. Doubts on one claim could lead to similar doubts, perhaps unfounded, on other claims. He warns that the longer it takes to settle a claim and provide answers to an unending stream of questions, the more it is likely to add to the losses already sustained. Wood's (op cit) advice is to resist pressure to inflate the total amount of the claim by interested parties such as the Site Agent, Chief Surveyor or Directors. He adds that a number of smaller claims may open

up a more embracing or spin off claim later on, based on the effect of their cumulative delays and lead to an extension of the contract period.

**2.6) Status**

Generally speaking, claims are classified as either approved (or allowable) as a head of claim or as disputed or unallowable. Vincent Powell-Smith (1988) and John Sims (1988) mentioned three of those disputed heads of claim; financing changes, interest and costs of preparing claims. On financing charges they said that whatever the position may be at common law about interest on outstanding debts and claims, it is now settled law that under the 'direct loss and/or expense' provisions of the JCT Forms - and it is submitted under similarly worded provisions in other forms - finance charges by way of interest expended are allowable as a head of claim. Indeed, the loss of interest that might have been earned on the money diverted from investment, i.e. compensation for the loss of use of money, the contractor is to be compensated for the financial burden arising from the fact that primary loss or expense would have been incurred some time before ascertainment and certification. 'Direct loss and/or expense' covers the financial burden to the contractor of being stood out of his money; it is not interest on a debt but a constituent part of the loss and/or expense. This principle was first established by the decision of the Court of Appeal of *FG Minter Ltd v Welsh Health Technical Services Organisation (1980),* which recognised the realities of the financing situation in the construction industry and gave a sensible and practical interpretation to the claims provisions. In Saudi Arabia under Sharia law, no compensation is granted for lost profits or the loss of use of money. Yet if a contractor proves the difficulties he has gone into by way of the outstanding debts and claims he had against the client, Sharia courts will look into that and

may, depending on the strength of proof, compensate the contractor handsomely. Powell-Smith and Sims (op cit) state that in common law, it is well settled that debts do not carry interest so that an employer who pays late on a certificate discharges his responsibility by paying the sum certified. This principle follows from the ruling of the House of Lords in *London, Catham and Dover Railway vs South Easter Railway Co (1893).* The rule has recently been updated by the House of Lords in *President of India v La Pmtada Cia SA (1984).* In section 19A of the Arbitration Act 1950 (inserted to the Administration of Justice Act 1982) arbitrators have some power. It states that unless a contrary intention is expressed therein, every arbitration agreement shall, where such a provision is applicable to the reference, be deemed to contain a provision that the arbitrator.... may, if he thinks fit, award simple interest at such rate as he thinks fit:

a) on any sum which is the subject of the reference but which is paid before the award for such period ending no later than the date of the payment as he thinks fit, and

b) on any sum which he awards, for such period ending no later than the date of the award as he thinks fit.

The power to award interest and conferred on an arbitrator.... by subsection (a) above, is without prejudice to any other power of an arbitrator to.... award interest'. Although this provision did not come into force until 1 April 1993, it has been held to apply to arbitration agreements made before, as well as after, that date: *Food Corporation of India v Marastro Co Naviera (1986).* Both judgment debts and sums directed to be paid by an arbitrator's award carry interest at the prescribed statutory rate as from the date of judgment or the award. Powell-Smith and Sims (op cit) state that the parties to a contract may, of course, expressly agree that a debt or other sum due under the contract shall carry

interest. Such a provision is made by section 60(6) of the ICE Conditions of Contract for Works of Civil Engineering Construction, under which the employer must pay interest on overdue payments. Criticising the JCT contract, Powell-Smith and Sims think that the Joint Contracts Tribunal would do well to consider making a similar provision in its standard forms as the current situation is manifestly unjust. Haswell and De Silva (op cit) see that an arbitrator may award interest by virtue of his implied authority to follow the ordinary rules of law. The question of interest as affecting the sum or sums of money awarded by an arbitrator may conveniently be divided into two elements; the first of these relates to any interest which the arbitrator may include in his award. In this connection it is not unusual for the advocate representing the Plaintiff to plead for interest and the arbitrator will, at the time of making his award, decide whether to accept or modify the plea and at least take note of Defence Advocate's counter argument. Where the question of interest has not been mentioned during the hearing, the arbitrator will have to decide from when and at what rate interest should be paid, if any. In Saudi Arabia under Sharia law, interest is looked upon as usury which is against Islamic belief. Thus no interest is granted to either party of a contract under Sharia Jurisdiction. The Saudi Ministry of Finance and National Economy has set up a special court under the umbrella of the Saudi Arabian Monetary Agency (SAMA) which is the central bank, to look into cases dealing with interest between local banks and their clients. This court will not abide to Sharia law and will grant local banks interest on their loans to clients. Addressing the point of the claim consultant's fees as a disputed head of claim, Powell-Smith and Sims (op cit) see that it is generally accepted that the contractor is not entitled to reimbursement for any costs he has incurred in preparing the claim, since he is not required to prepare a claim as such, but merely to make a written application to the

architect, backed up by supporting information, Most certainly, fees paid to claims specialists or to outside quantity surveyors or other professional advisers are not in principle allowable as a head of claim at law. Where a claim proceeds to arbitration or litigation, of course, the contractor is entitled to claim his costs, and the arbitrator's award or judgment of the court can condemn the employer in cost. In *James Longley & Co Ltd v South West Regional Health Authority (1984),* on a summons to review taxation of costs of an arbitration which was settled during the hearing, the fees of a claims consultant in respect of work done in preparing the contractor's case for arbitration (the preparation of these schedules annexed to the Points of Claim) were allowed as those of a potential expert witness in the arbitration. The practice of the High Court is that 'costs follow the event', ie in the ordinary way, the successful party will receive his costs, and an arbitrator must follow the same principle. However, they added that it has been held that the expenditure of managerial time spent in remedying an actionable wrong done to a trading company can properly form the subject matter of a claim for 'special damage' in an action at common law: *Tate & Lyle Food and Distribution Co Ltd v Greater London Council (1982).* It seems that in light of this decision, there can in principle, be a claim for the cost of managerial time spent on preparing a claim, for head office overheads, in appropriate circumstances, and subject to proof that the time had been spent in a manner in which it would not have been spent otherwise. Under the same principle, the cost of employing an outside expert might be recoverable as damages for breach of contract. In Sharia law consultant's fees (whether legal or other) are not allowable as head of claim because these expenses incurred by a party to a contract do not constitute a basic function of realising this contract and are rather looked upon as expenses to collect the due payments.

## 2.7) Filing / Examination

On the examination of a claim, Hughes and Barber (1992) said that at this stage the claim is considered by the A/E/QS and some negotiation may take place. Although he will already have been alerted by notice from the contractor of the circumstances or events giving rise to the claim and the expectation of its submission, the A/E/QS cannot consider the claim fully until it is presented. During the intervening period he will have been able to ensure that adequate and reliable records were kept. He may have been able to deal with some causes of the claim, for example, by increasing his own resources to speed up the supply of drawings or prompting the employer to provide possession of parts of the site - it is one of the potential benefits of the conventional contracting system that the A/E/QS is often in a position to mitigate as well as adjudicate on claims. Hughes (1985) on the topic of examination said that the technique to be employed in examining claims corresponds to the technique involved in constructing them. Suffice it to say here that it is necessary to be objective, to attempt to prove or disprove factually the assertions or allegations made. It is necessary to check facts, starting with the documents which constitute the contract. One is entitled to assume nothing. Check the facts. It is often possible to reach agreement between the two sides as to certain facts (weather, number of men, working or idle plant, hours worked, etc) without necessarily reaching agreement at that stage as to their import. Such a step can save a great deal of time in checking these matters independently. Hughes and Barber (op cit) added that correspondence between contractor and A/E/QS at this stage may help to identify whether there is a basis of claim and what are the significant questions to be addressed, but the A/E/QS ought clearly to be acting throughout this stage on behalf of the employer, investigating the

facts and considering the legal and contractual arguments opposed to the contractor's contentions. It is only after consideration of the employer's side that he can proceed to making a decision. They added that this stage may also include negotiation of agreements: some standard forms expressly empower the A/E/QS to make agreements with the contractor on specific categories of claim, such as the value of variations. In those cases it is only if agreement cannot be reached that the A/E/QS goes on to the next stage of making a decision. In attempting to reach agreement the A/E/QS is negotiating on behalf of the employer. He ought clearly to be on the opposite side of the negotiating table, not seeking to hold a balance (although he would be foolish to refuse to agree a settlement that he would subsequently have to award by decision). It is open to the A/E/QS to refer to the employer for his input, so long as the A/E/QS is not, and does not regard himself as, bound by the employer's comments in regard to any decisions involving a discretion. There is no reason why the employer should not actually insist on being consulted, but the contractor is not affected by such a requirement unless he has notice of it.

## 2.8) Process / Decision / Establishment of Claim

On the issue of decision Hughes and Barber (1992) stated that where the contract does not provide for such agreements or where agreement is not reached, the claim proceeds to another stage, the initial decision of the A/E/QS. The law recognizes two classes of decision: those that are regarded as purely administrative decisions and those involving the exercise of a discretion. Confusion is often generated because a legal discretion is not the same as a practical discretion. For example, a decision whether timber is of fair quality is probably regarded by the law as purely administrative, even if the specification refers to the opinion of

the A/E/QS; the construction professional would probably say he had a discretion in that he could overlook minor defects. Certification of payment for work performed in accordance with the contract is generally an administrative duty. In *Sutcliffe v Thackrah* there is ample guidance that in certifying payment for work so performed the A/E/QS is required to exercise his professional skill and knowledge as it should be exercised and to act honestly; he is not employed to be unfair to the contractor, but no question of impartiality arises. Hughes and Barber (op cit) added that where a legal discretion is involved, for example, in assessing entitlement to extension of time for completion, the position of the A/E/QS is different. He has to take on a dual role. He has to consider the evidence and arguments on both sides as a judge or arbitrator, but unlike a judge or arbitrator, he also has to supply the evidence and arguments on one side. It is not (contrary to popular belief) a free discretion; he is bound to apply objective standards. On the issue of establishment of a claim Hughes and Barber (op cit) said that it is for the contractor to state the reason why he considers himself entitled, and to how much. Some contractors seem to think that if they merely inform the architect, engineer or quantity surveyor that something is wrong, that they are losing money, or not being paid as much as they expected, then it is up to the architect or engineer or quantity surveyor to find reasons and make an evaluation. If they do not go that far, many feel that if they base their claim wrongly then it is up to the employer's professional advisers to correct it and perhaps to indicate the correct basis. Such ideas are totally fallacious. Should a dispute ever get to arbitration then there is no question but that the claimant must prepare his points of claim and state the amount he is seeking. There is no difference in initiating a claim, nor should there be, for the contractor is the only one who can know the effect of circumstances upon him and certainly no one else can know the financial

consequences. They added that although it is undoubtedly the case that it is for the contractor to state why he considers himself entitled, and to quote conditions of contract where appropriate in support of his contentions, it is not to be thought that Conditions of Contract contain a 'claims clause 'as such which if quoted acts in some way as an 'open sesame'. Clause 52(4) of the ICE Conditions has sometimes been regarded as one such but this is purely a procedural clause and of itself gives no entitlement to payment. Hughes and Barber (op cit) added that claims usually arise from events or circumstances where one party is alleged to have done something to the detriment of the other, or has failed to do something he has undertaken to do. The Conditions of Contract attempt to anticipate such events and circumstances in one or other of their clauses and it is one (or more) of these that needs to be quoted in support of any claim. Where no such provision covers the event or circumstances in question then one must seek some principle of common law which covers the matter. They added that admittedly it may not always be possible in the first instance to cite a condition of contract with absolute certainty - it may be necessary to quote alternative grounds - but clearly if it is to be expected that serious consideration be given to a claim (not to mention some payment on account) then a decision must be made and the claim prepared accordingly. Occasionally, in the course of discussion it may become apparent that the ground chosen is incorrect. There would seem to be no reason why at that point the contractor should not restate his case on other (and this time) correct grounds. Obviously he should avoid such an occurrence if at all possible as it does not reflect well upon his efficiency or credibility to have to change ground. Sometimes, however, it is unavoidable and again, provided a contractor is not acting frivolously, he should not be penalized. He would in fact be able to take such a course upon referring the matter to arbitration (when,

perhaps for the first time, he has the benefit of legal advice). On establishing claims Hughes and Barber (op cit) stated that it is necessary as far as possible to identify each separate event or matter which is considered to give rise to an entitlement of payment, to state the reasons for so considering and to evaluate its effect. Claims, however, are often composite; work in connection with a variation order may involve not only dissimilarity of conditions but also extra time, which may need to be distinguished from delay as such. It may be necessary on occasion to dissect a claim, even on some arbitrary basis, where one aspect attracts profit and another, being in the nature of damages, does not. On the other hand, a number of matters may cause delay and disruption with the result that there is a cumulative effect such that it is not possible to separate the result financially of any one cause or event in isolation. In such a case, they may be taken together and assessed as a whole - provided profit is eliminated and there is no overlap.

## 2.9) Type

On the type of claim, Hughes (1985) mentioned several of them as follows:

Claims arising from documentation

Claims arising in connection with execution of the work

Claims concerning payment provisions

Claims concerning time

Claims arising from default, determination etc

Compound claims

Powell – Smith and Sims (1988) mentioned four types of claims. These were

1- Contractual claims

2- Common law claims

3- Quantum meruit claims

4- Ex gratia claims

They elaborated on the types by stating each type as follows:

**i) Contractual claims**

These are claims that arise out of the express provisions of the particular contract, e.g. for 'direct loss and/or expense' under certain clauses of the Joint Contracts Tribunal (JCT) Standard Forms.

**ii) Common law claims**

Common law claims are usually and misleadingly called 'ex-contractual' or 'extra-contractual' claims in the construction industry. (These terms should not be confused with the Latin term ex contractu, which is sometimes found in legal textbooks to refer to claims 'arising from the contract', i.e. contractual claims as already defined.). Common law claims are claims for damages for breach of contract at common law and/or legally enforceable claims for breach of some other aspect of the law, e.g. in tort or for breach of copyright. Entitlement to such claims is expressly preserved to the contractor by the JCT Forms: see JCT 80, clause 26.6 and JCT 63, clause 24(2); it is also so preserved by most other standard forms, and a common law claim for breach may avoid some of the restrictions under the contract, as to the giving of notices and so on.

**iii) Quantum meruit claims**

A quantum meruit claim ('as much as he has earned') provides a remedy for a person who has carried out work where no price has been agreed or where the original contract has been replaced by a new one and payment is claimed for work done under the substituted contract.

**iv) Ex gratia claims**

An ex gratia ('out of kindness') claim is one which the employer is under no legal obligation to meet. It is sometimes called a 'sympathetic' claim. Ex gratia claims are often put forward by contractors but are seldom met unless some benefit may accrue to the employer as a result. For example, an employer might agree to make an ex gratia payment to save a contractor from insolvency where the cost of employing another contractor to complete the work would be more than the amount of the ex gratia payment. Hughes and Barber (1992) when discussing the type of claim, mentioned several types as follows:

1- Claims concerning the existence of a contract

2- Claims arising from documentation

3- Claims arising in connection with execution of the work

4- Claims concerning payment for work

5- Claims concerning time

6- Claims arising from breach or termination

7- Compound claims

Wood (1978) discussed some types of claims as follows:

Ex gratia or extra-contractual claims are those which do not arise expressly from a specific contract Clause or Condition and must not be

confused with, for instance, Clause 24 (2) of the J.C.T. Form of Contract - i.e. "any other rights, actions and remedies which the Contractor may possess" or litigation or arbitration under other forms of contract or with ex contractual or ex contractu claims. Ex gratia claims, however, are sometimes presented to the Client, Employer or Authority by the Contractor in the hope of receiving favourable consideration for payment of matters not derived from the legal Contract, or are breaches of Contract, but if a Contract has been executed on time and with an acceptable quality of workmanship and material, the Client may (rarely) without any obligation whatsoever give in special circumstances an ex gratia payment (in part or in whole) and therefore treat the claim sympathetically (hence the title "sympathetic claim"). It must be realized that in these claims the Contractor has little or no real redress if the Client is unsympathetic. Ex gratia claims originate because the Contractor has made a loss which to all intents and purposes is the fault of no one but nevertheless wishes to obtain reimbursement if it is at all possible, and should the Contract have been completed on time (or earlier) and the work is highly satisfactory in every way the Contractor may be fortunate enough to arouse the sympathy of the Client, especially if he feels a moral obligation not to score off the Contractor's misfortune when due to no fault of his own. An ex gratia claim always requires the Contract to be in a loss situation as a basic element. Some contracts, however, contain specific references to ex gratia payments, when of course the legal situation is quite different. See for example the judgment of Megaw, J., in *Edwards v. Skyways, Ltd., 1964.*

**v) Ex contractual (Ex Contractu) Claims**

Ex contractual or ex contractu claims are completely distinct from ex gratia claims. They are concerned with breaches of contract for which

there are no grounds under the Contract clauses or conditions. They are actionable by litigation or arbitration. These claims are quite expressly given under the J.C.T. Form of Contract in Clause 24 (2). The professional parties of Architect, Engineer or Quantity Surveyor have no power to deal with such claims unless they have the express permission of the Client to so do. In any circumstances they would need legal advice in their deliberations.

**2.10) Settlement**

On the settlement of claims Reg Thomas (1993) discussed the hearing process by saying that the hearing often follows similar lines to court proceedings except that they are normally less formal. They are normally held at a neutral venue, such as a hotel, but there is no reason why they should not be held at the offices of one of the parties. The arbitrator formally opens the hearing, followed by:

- The opening address given by the claimant which sets out the issues, the evidence supporting the claimant's case and any submissions on the law which may be relevant;
- Presentation of claimant's witnesses; examination of witnesses on oath by the claimant;
- Cross-examination of claimant's witnesses by the respondent;
- Re-examination of claimant's witnesses by claimant;
- Respondent's opening address;
- Presentation of respondent's witnesses; examination of respondent's witnesses by respondent;
- Cross-examination of respondent's witnesses by claimant;

•Re-examination of respondent's witnesses by respondent;

•Respondent's closing address;

•Claimant's closing address.

The hearing may take one or two days, or it may consist of several hearings over several months. Some hearings may deal with particular issues in dispute, and some may deal with purely procedural matters. On settlement using alternative dispute resolution techniques, Hughes and Barber (1992) said that various other methods of dispute resolution are available involving the assistance of a third party. These include 'mediation' and 'conciliation'. Unfortunately, the two terms are difficult to define as they are used to mean different things in different parts of the world. The essential question is whether the conciliator or mediator expresses an opinion or merely acts as a go-between. Attempted conciliation or mediation is stipulated or permitted in some contracts as a step before arbitration, as in FIDIC4, ICE6, the ICE Minor Works Conditions, and the Hong Kong Government General Conditions of Contract (1985). The ICE has produced a Conciliation Procedure, which is referred to in ICE6 Clause 66 and the ICE Minor Works Form. In Hong Kong, there is a powerful mediation procedure for use on Government contracts. Such procedures can help parties to reach agreement and the cost is much less than arbitration. The draw-back is that even if the mediator or conciliator produces proposed terms of settlement, they do not bind the parties directly as does the award of an arbitrator. The terms of settlement only become binding if accepted and agreed by the parties. Another form of ADR. which has been found successful in the United States and has attracted attention in the UK, is the mini trial. In this process, a neutral assessor sits together with two senior executives - one from each party - to hear presentations by the respective organizations.

The neutral assessor can explain any points of principle and assist the executives to reach a settlement. The success of the system is of interest in its own right. but it also has more fundamental significance. It provides a reminder of the ingredients needed for informed settlement of disputes generally. These are that:

1- There should be someone on each side appointed to deal with the dispute with authority to settle.

2- The person on each side should be fully informed of the facts and arguments which support his own side's case. He should also appreciate and understand the weaknesses of his own side's case.

3- The appointed person on each side should understand the strengths and weaknesses of the other side's case.

4- The appointed persons on each side need to communicate and overcome distrust.

Power, responsibility, integrity and understanding are the vital keys to informed settlement of disputes.

## 2.11) Payment

On payment Hughes and Barber (1992) mentioned three matters:

*Valuation of contract work* - This is a matter concerning only measure and value contracts, as in lump-sum contracts the contract sum is already fixed and is adjusted by addition and deduction. Problems in this category are usually centered on the applicability of B/Q descriptions to the work as executed (including perhaps errors or deficiencies in such description) and the question of whether or not the B/Q price applies to increased or decreased quantities. *Valuation of varied work* - This is a most prolific source of claims and disputes and these generally center upon whether the

work in question is similar in all respects both as regards its character and the conditions under which it is executed. This matter of similarity is fundamental and includes time, timing, sequences, relationship to other work being done concurrently and everything else which could cause a difference of cost compared with work which might otherwise be similar so far as the tendered prices are concerned. *Other provisions for payment* - Here are included matters which are in the nature of breach of contract by the employer, such as delay in supplying information etc. (see Clause 26 of JCT 8O Clauses 7, 13, 14, 31, 42 of ICE and Condition 53 of GC/Wks 1 Ed 2). Although provision is made for adjustment in the contract the analogy of breach and the corresponding remedy of damages is often reflected in Conditions of Contract by excluding entitlement to profit. Delay in this sense is not to be confused with extra time for extra work which may be involved in variations. On payment into court Hughes and Barber (op cit) said that provision is made in the rules for a defendant to make a 'payment into court', which the plaintiff is entitled to take out in full and final settlement of his claim (or part of his claim if separate parts are involved). Time limits apply for the plaintiff to accept the payment in; thereafter he must obtain an order of the court. The plaintiff taking such a payment in full and final settlement of his whole claim before commencement of the hearing will also be entitled automatically to his legal costs down to the date of the payment in. The incentive for the plaintiff to take the payment in settlement, even if it does not quite match his expectations or aspirations, lies in rules on entitlement to legal costs. The general rule is that 'costs follow the event': a successful plaintiff will be awarded his costs as part of the judgment; an unsuccessful plaintiff will have to pay the defendant's costs. But success in this context is judged taking into account any payment into court. If the plaintiff fails to beat the amount of the payment in, he will have to bear

not only his own costs from the effective date of payment in, but also the defendant's costs incurred after that date. As costs can exceed the value of the original claim, this is a powerful incentive to each side respectively to make and accept realistic offers. The rules are equally applicable to counterclaims. In Sharia Law consultant's fees (whether legal or other) are not allowable as head of claim because these expenses incurred by a party to a party to a contract do not constitute a basic function of realising this contract and are rather looked upon as expenses to collect the due payment.

From the previous discussion of a claim's life span the following figure (Fig 2-1) can be plotted to show the phases of such a life span. Phase I, which is the preliminary stage starts with the initiation of a claim through other steps such as notice and preparation, taking into consideration the necessary format and noticing the scale and status of a claim. Phase II, which is the working stage, constitutes such steps as filing, examination and establishment of a claim, taking into consideration the type of this claim. Phase III is the final stage where settlement occurs followed by payment of entitled sums.

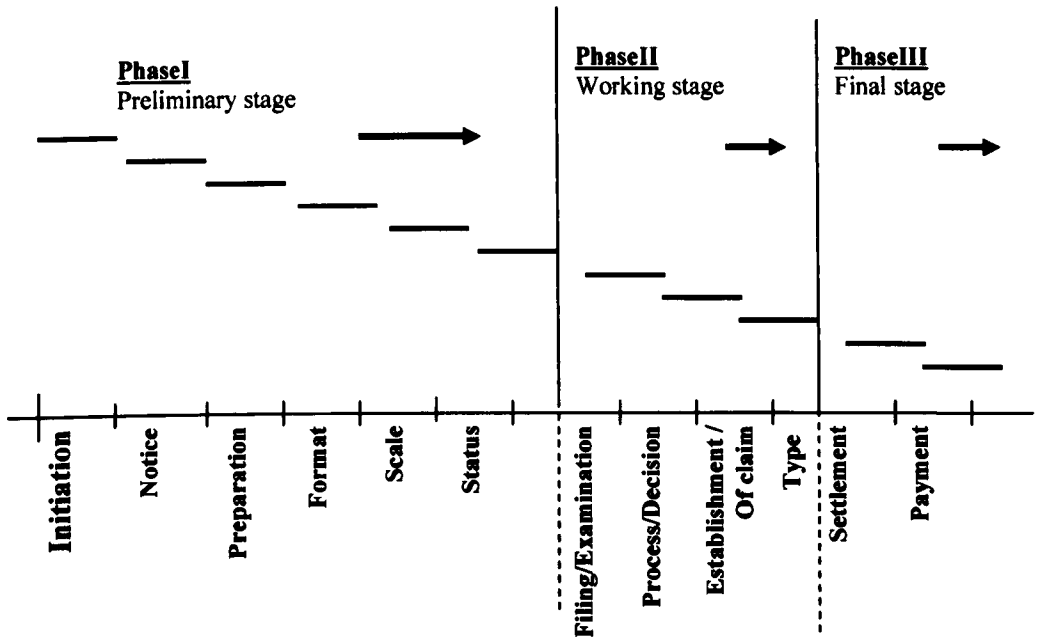


**Fig (2-1) Phase-Based chart of a claim's life span**

**Summary**

From the literature review some independent variables can be deducted concerning the party to a project. From the client group owners appear to be the dominant party, from the engineering group the consultant is the main figure and from the contractor's group the contractor is the main independent variable to be considered here. Some dependent variables are deducted from this literature review concerning the effect of claims. These variables as seen from the literature review are: money, time, quality, function of a project, reputation of the parties, future relations, operation, and life expectancy of a project. All the previous dependant or independant variables will be the necessary ingredients for exploring the problems in this research.

# Chapter 3

## Research Methodology

### Introduction

The research questions will be developed into research hypotheses which will be statistically tested for verification. The hypotheses will come out of the research strategy discussed later in this chapter which will include a comparison between quantitative and qualitative research approaches, the validity and reliability of the research methodology, and reliability of the data. Some practical considerations will be discussed together with the strategy for validating the research. Light will be shed on the questionnaire design and the data collection. This chapter will also discuss the pilot study that was run before the questionnaire, while stating the limitations to this study.

### 3.1) Hypotheses

The main purpose for undertaking this research was given earlier in the introduction. The research questions to be derived from the introduction are as follows:

1. Do the **parties** to a project have any influence on the kind of claim?
2. Does the **ownership** of a project (Government or Private) have an influence on the kind of claim?
3. Does the **size** of the project affect the kind of claim?

These research questions have developed into research hypotheses, which will be statistically tested for verification. The hypotheses were developed as the following (in null hypotheses form):

**H1**: The type of party to a project does not have an influence on the kind of claim.

**H2**: The project party does not affect the eight variables.

**H3**: There is no difference between the types of claims submitted in Government or Private projects.

**H4**: The type of ownership (Government or Private) does not influence the eight variables.

**H5**: The size of the project has no influence on the type of claim.

**H6**: The size of a project has no influence on the eight variables.

The variables to be operationalized were identified from the previous literature review and were identified into dependent and independent variables as follows: see Fig (3-1)

a) The dependent variables

Time – Money – Quality - Operation – Function – Life expectancy – Reputation and Future relations.

b) The independent variables:

Party to a project: Owner – Contractor - Consultant

Project Ownership:Government – Private

Project Size: small – medium – large

**Relationships between claims variables**

From the previous literature review an initial model can be put up dealing with the main ideas to be discussed in this research; sources of claims, causes of claims and the effect of these claims. The model is shown in Fig (3-1) below.

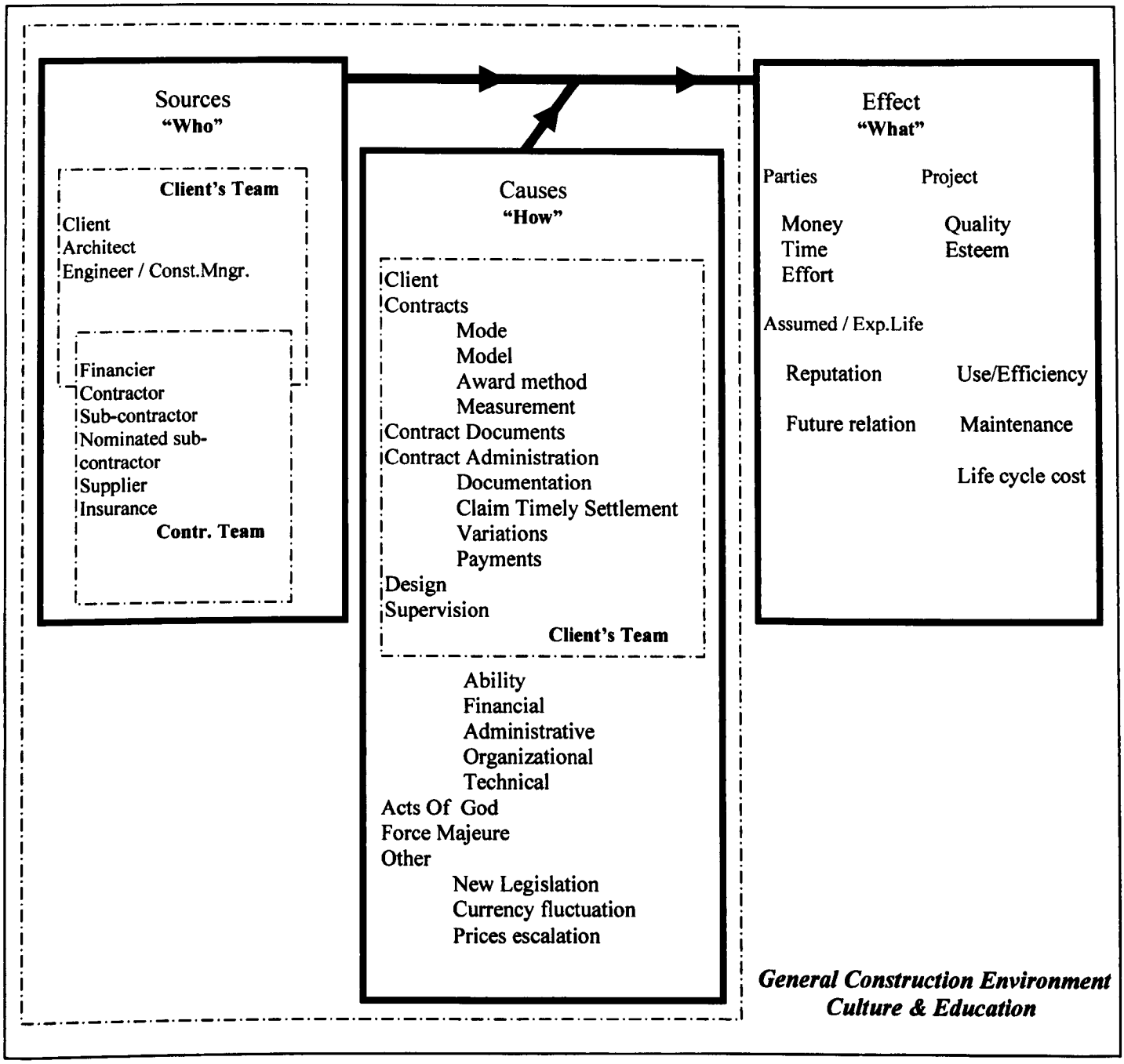


**Fig (3-1) Relationships between claims variables**

## 3.2) Methodology Theory and Strategy

In order to test the above hypotheses, data will be gathered from the field (i.e the Saudi construction industry). An appropriate methodology will be developed in order to collect these data in the most suitable manner. Some theoretical consideration will be discussed here.

Gill and Johnson (1997) described the array of approaches for testing or judging hypotheses as a continuum of techniques, ranging from the deductive at one end to the inductive at the other. They saw the process of deduction involving several stages:

1. The concepts which represent important aspects of the theory of the problem have to be established. These concepts are linked together in a causal chain to yield a theory or a network of hypotheses.
2. These concepts then need to be operationalised.
3. Operationalisation creates specific instruction about what to observe and how. This enables the testing of hypotheses by confronting them with empirical data.

The outcome of testing operationalised concepts within a network of hypotheses against facts collected by observation enables corroboration of the theory as a valid (or invalid) explanation. From Popper (1974) the process of deductive research can be expressed as follows:

1. Theories are developed that are capable of being empirically tested.
2. Scientists vigorously attempt to refute these theories.
3. Science advances as refuted theories fall away, leaving theories yet disproved.

Gill and Johnson (1997) say that neither the deductive nor the inductive are intrinsically more appropriate or better for research of a sociological hypothesis: both approaches have advantages and disadvantages in terms of practical philosophical and ethical considerations. The following is a table (Table 3-1) of comparison between deductive research methods from Gill and Johnson (1991).

| Deductive Methods | Inductive methods |
|---|---|
| Explanation via analysis of causal relationships and explanation by covering laws(etic) | Explanation by subjective meaning systems and explanation by understanding (emic) |
| Generation and use of quantitative data | Generation and use of qualitative data |
| Use of various controls (physical or statistical) so as to allow the testing of hypotheses | Commitment to research in every day setting to allow easy access to and minimize reactivity among the research subjects |
| Highly structured research methodology to ensure replicability of above characteristics will occur | Minimum structure to ensure above characteristics will occur |

**Table (3-1) A Comparison of Deductive and Inductive Methods of Research (Gill & Johnson.1991.pp.37).**

### 3.3) A Comparison Between Quantitative and Qualitative Research Approaches

Cell (1998) said that critics of qualitative techniques are often known to question the integrity of qualitative researchers. They try to discredit this paradigm by asking whether any one knows that they haven't made it up. Hussey and Hussey (1997) see that although it is usual to associate a positivistic paradigm with measurement, it is also possible for a positivistic paradigm to produce qualitative data and vice versa. Lennard et al (1997) noted that when qualitative and quantitative methods are used in tandem, high levels of authenticity and

generalisability are possible. Martin (1990) noted that any research, whether qualitative or quantitative, must include subjective elements. He further suggests that historically, studies of organization structure, technology and size for example tended to rely on quantitative methods, while investigations into organizational culture usually involve qualitative methods. Naoum (1998) noted that quantitative research is selected under two circumstances:

1. When the researcher wants to find facts about a concept, a question or an attribute.
2. When he wants to collect factual evidence and study relationships between these facts in order to test a particular theory or hypotheses.

He adds that in a quantitative study, the hypotheses, research questions and objectives can be better understood when they are grounded in a theoretical framework. Kerlinger (1979) cited in Creswell (1994) defined a theory as a set of interrelated constructs (variables or questions) that presents a systematic view of phenomena by specifying relationships among variables, with the purpose of explaining natural phenomena. Here the systematic view might be an argument, a discussion, or a rational that helps explain (or predict) phenomena that occur in the world.

Naoum (op cit) stated that a theory can be introduced as either a series of hypotheses /sub-hypotheses, in the form of 'if.....then' logic statement, or in the form of a hunch. Creswell (1994) noted that in the quantitative studies one uses a theory deductively and places it towards the beginning of the plan for a study: the objective is to test or verify a theory, rather than develop it. One thus begins the study advancing the theory, collects data to test it, and reflects on whether the theory was

Confirmed by the results in the study. The theory becomes a framework for the entire study, an organizing model for the research questions or

hypotheses and for the data collection procedure. The following is (Table 3-2) from Naoum (1998) discussing the differences between quantitative and qualitative research.

| | Quantitative | Qualitative |
|---|---|---|
| 1- Role | Fact - finding based on evidence or records | Attitude measurement based on opinions, views and perceptions measurement |
| 2- Relationship between researcher and subject | Distant | Close |
| 3- Scope of findings | Nomothetic | Idiographic |
| 4-Relationship between theory / concepts and research | Testing /confirmation | Emergent / development |
| 5- Nature of data | Hard and reliable | Rich and deep |

**Table (3-2) differences between quantitative and qualitative research Source Naoum (1998) page 43**

### 3.4) Research and Methodology Strategy

Naoum (1998) stated that research strategy can be defined as the way in which the research objective can be questioned. There are two types of research strategies, namely' quantitative research and qualitative research. Deciding on which type of research to follow, depends on the purpose of the study and the type and availability of the information which is required. The technique known as triangulation can be used to overcome the potential bias and sterility of a single approach (Hussey and Hussey 1997).Vincent Guy (1999) asks how many triangles there should be and provides a diagram that helps answer this question. The diagram

reflects the process undertaken in this research in that triangulation has taken place at the sample level. The following (Figure 3-2) is the diagram or triangulation suggested by Guy (1999).

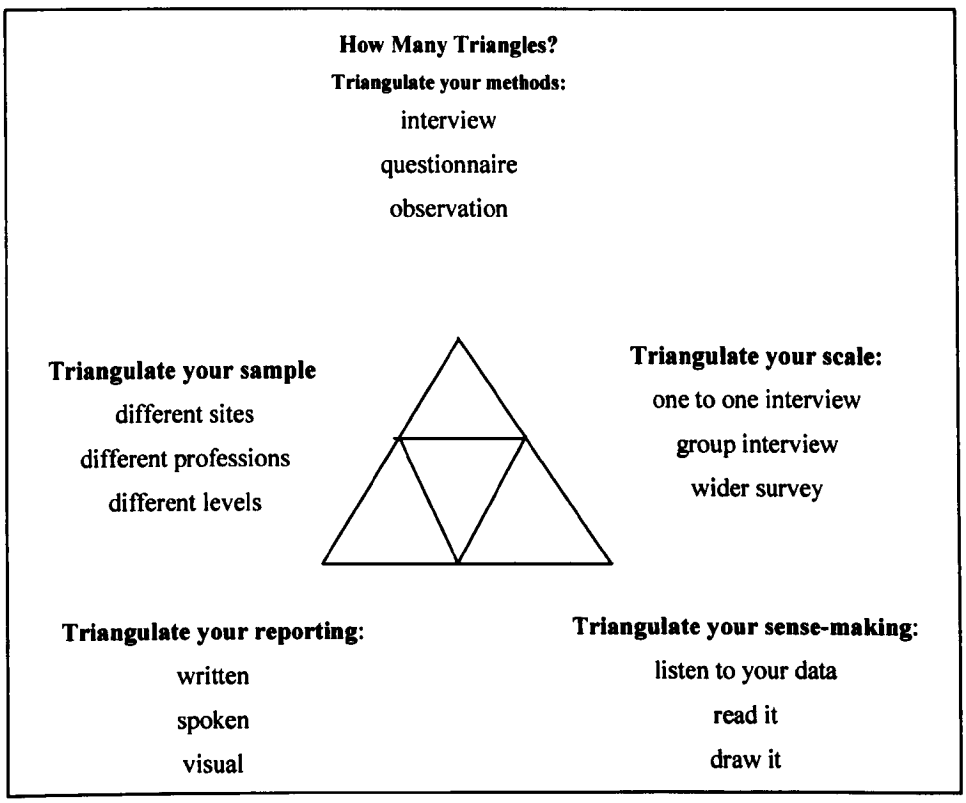


**Figure (3-2) Triangulation in Research**
**Source Guy (1999)**

## 3.5) Validity, Reliability and Generalisability of Research Methodology

Bonoma (1985) noted that ideally all researchers seek high level of both data integrity and results currency; however, as researchers make method choices they often must trade these against one another. Will the research stand up to outside scrutiny and will anyone believe what is being said about it (Easterby – Smith et al 1991). The concept of data

validity, reliability and generalisability were originally developed within the positivist paradigm as a means to test research for academic rigour. Mc Grath (1984) has also discussed the concept of generalizability as applied to research in social and behavioural sciences. He says that there is a fundamental dilemma associated with research methods. As researchers gather a batch of evidence, Mc Grath sees that they will try to maximize three things:

1. Generalizability of the evidence over populations of actors.
2. Precision of measurement of the behaviour studied.
3. Realism of the situation or context.

He points out that when researchers would like to maximize each of these, to increase one of them reduces one or both of the other two. Stroh (2000) described the inferences that can be drawn from qualitative research as "common sense" or logical rather than statistical. Hussey and Hussey (1997) ask researchers to look for patterns, concepts and theories that have been generated in the research, challenging him/her to apply them in other environments. The patterns, concepts and theories referred to here will be discussed in the conclusion chapter of this research.

### 3.6) Positive and Phenomenological Paradigms

Easterby-Smith et al (1991) propose three levels of use of paradigms. The philosophical level, reflecting basic beliefs about the world, the social level, giving guidance to researchers on how to conduct such an endeavour and thirdly a technical level which details methods and techniques to be adopted in conducting research. The following (Table 3-3) summarizes what Easterby-Smith et al refer to as pure versions of each paradigm.

| | Positive Paradigm | Phenomenological Paradigm |
|---|---|---|
| Basic Beliefs | The world is external and objective | The world is socially constructed and subjective |
| | Observer is independent | Observer is part of what is observed |
| | Science is value free | Science is driven by human interests |
| Researcher Should | Focus on facts | Focus on meanings |
| | Look for causality and fundamental laws | Try to understand what is happening |
| | Reduce phenomena to simplest elements | Look at totality of each situation |
| | Formulate hypotheses and then test them | Develop ideas through induction from data |
| Preferred Methods Include | Operationalising concepts so that they can be measured | Using multiple methods to establish different views of phenomena |
| | Taking large samples | Small samples investigated in depth or over time |

**Table (3-3) Pure versions of Paradigm. Source Easterby-Smith et al (1991)**

Hussey and Hussey (1997) recognize the need for researchers to understand there personal paradigm and their personal preference, which has a strong influence over selection. They see that the researcher's basic beliefs about the world will be reflected in the design of the research, collection and analysis of data, and the way in which a thesis is written. Martin (1990) offers some reasons as to why the nature of a theoretical problem does not always dictate the choice of an appropriate method. These are:

- Availability of resources.
- Likelihood of particular results being found.
- Preference of researcher.
- Skills of researcher

Martin points out that all too often; methodologies are discussed as if they were scientific religions – each one labelling itself the one true faith. Hussey and Hussey (1997) acknowledge that phenomenological researchers often approach their research with no prior theories, believing that to do so would constrain and blinker them. The following is a (Table 3-4) from Easterby-Smith et al (1991) discussing the questions of reliability, validity and generalisability from the positivist and phenomenological view points.

| | **Positivist Viewpoint** | **Phenomenological View point** |
|---|---|---|
| Validity | Does an instrument measure what it is supposed to measure | Has the researcher gained full access to the knowledge and meaning of information? |
| Reliability | Will the measure yield the same results in different occasions (assuming no real change in what is to be measured)? | Will similar observations be made by different researchers on different occasions? |
| Generalisability | What is the probability that patterns observed in a sample will also be present in the wider population from which the sample is drawn? | How likely will the ideas and theories generated in one setting also apply in other settings? |

**Table (3-4): Questions of Reliability, Validity and Generalisability**

**Source: Easterby-Smith et al (1991)**

### 3.7) Reliability of data

Several measures were taken to assure the reliability of the data in the research:

1. The sample carefully represented the populations, particularly the three parties to the project (owners, contractors, and consultants). It also represented the ownership (government and private) and the size of projects (small, medium and large). The overall size of the sample (one hundred respondents) was seen to convincingly represent the population in statistical terms. Tables (3-5), (3-6)& (3-7)

| Total sample size | Owners | Contractors | Consultants |
|---|---|---|---|
| 100 | 25 | 29 | 46 |

**Table (3-5): Break down of the sample (Parties to a project)**

| Total sample size | Small size (under 5 million Saudi Riyals) | Medium size (5-20 million Saudi Riyals) | Large size (over 20 million Saudi Riyals) |
|---|---|---|---|
| 100 | 38 | 28 | 34 |

**Table (3-6): Break down of the sample (Size of a project)**

| Total sample size | Government | Private |
|---|---|---|
| 100 | 38 | 62 |

**Table (3-7): Break down of the sample (Ownership of a project)**

2. The questionnaire design was developed carefully to elicit the necessary data and mostly closed ended questions were used with some rating scales.
3. Administering the questionnaire by mail and random choices of names of respondents (one thousand questionnaires mailed) would add to the reliability of the data, and prevent respondents' leading

in interviews.

4. Reliability and validity of the results were sought through the application of the chi-square test to the results of all questions to ensure that they could not have occurred as the consequence of error or chance. Spearman correlation coefficient test was also applied to some results. These will be described in later chapters.

Gill and Johnson (1997) propose three criteria with which to evaluate the various methodological options and select an appropriate one to conduct a specific research project.

### 3.7.1 ) Internal Validity

This refers to whether or not what is identified as the cause (s) or stimuli actually produce what have been interpreted as the effects or responses.

### 3.7.2) External Validity

This refers to the extent to which any research findings can be generalized or extrapolated beyond the immediate research sample or setting in which the research took place. This relates to both the wider population (population validity) and the social context (ecological validity).

### 3.7.3 Reliability

This refers to the consistency of results obtained in research. To satisfy this criterion it should be possible for another researcher to replicate the original research using the same research design under the same conditions. The following is a (Table 3-8) classifying the basic research techniques in relation to each criterion based on Gill and Johnson (1997) and Cassel & Symon (1994) as cited in Hall (1999).

| Criteria / Methodology | Internal Validity | External Validity (Population) | External Validity (Ecological) | Reliability |
|---|---|---|---|---|
| **Experimental Design** | V. Good | V. Poor (Probably) | V . Poor | V. Good |
| **Quasi-experiments and Action Research** | Fair - Good | V. Poor (Generally) | Fair | Fair - Good |
| **Survey/Questionnaire Research Designs** | Fair - Poor | Good – V . Good | Fair - Poor | Good – V . Good |
| **Ethnographic Research** | Fair - Poor | Poor – V . Poor (Usually) | Good – V . Good (Relatively) | V . Poor |

**Table (3-8) Evaluation of Basic Research Methodologies (based on: Gill & Johnson. 1997 and Cassell & Symon, 1994).**

## 3.8) Practical Considerations

It is important to decide on which methods are accessible and which are likely to be successful in enabling the testing out of the theory. These issues are a function of resources and the nature of the research (Allan and Skinner 1991). Resources include the time consideration, manpower and financial limits, which form and constrain the environment for actually carrying out the research. If resources were plentiful, many people can carry out a number of validation methods independently, and bring their findings together to develop a deep, reliable and valid understanding of the social phenomena under consideration. In the same time, a long time period enables longitudinal testing to be conducted. A single researcher operating within a limited time frame will be limited in term of the methodological options available, before making the necessary philosophical choice and developing the specific research strategy. Consequently this has

implications for the validity and reliability of the subsequent research (Hall 1991). If the subject population is small, techniques containing high population validity become unnecessary and inappropriate. It is wise to select an option that is likely to successfully yield good data. If for any reason the respondents find it difficult to respond or refuse to do so, the resulting data are likely to be inaccurate and non representative. In this case one should choose an alternative method, which does not rely on those conditions.

### 3.9) Units of Analysis

The primary unit of analysis in this research is the project. Through the analysis of the project, the project party (owner, contractor, and consultant) forms a basis for investigation into their views on claims types and weight of association. Another unit of the project is the ownership (Government or Private) into which investigation is undertaken to find the influence of these independent variables on claims types and weight of association of claims. The third unit of analysis emerging out of the project is the size (small, medium or large). Again investigations are undertaken to find any effect of the size of a project on the type and intensity of a claim.

### 3.10) Strategy for Validating the research.

The strategy chosen for validating this research is illustrated in the following (Figure 3-3):

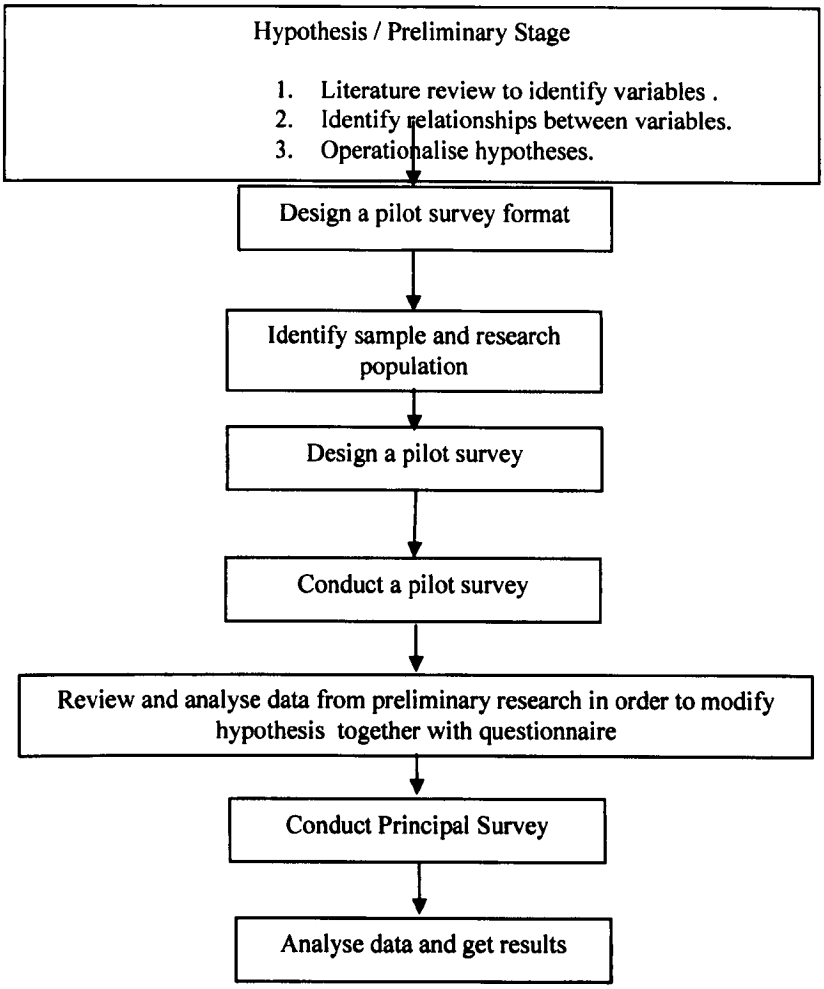


**Figure (3-3): Strategy for validating the research**

## 3.11) The Survey Approach

Surveys are used to gather data from a relatively large number of respondents within a limited time frame. It is thus concerned with a generalized result when data is abstracted from a particular sample or population (Naoum 1998). He states two types of surveys available:

1. The descriptive survey which aims to answer such questions as How Many? Who? Where? When? It deals with counting the number of respondents with certain opinions / attitudes towards a specific object. The counting can be later analyzed to compare or illustrate reality and

trends.

2. The analytical survey which aims to establish relationship and association between the attributes / objectives of the questionnaire, i.e. how often an attribute is associated with another attribute within the sample questionnaire.

Analytical research means that an element has been identified that causes, affects or has an influence on another element. This is basic to the logic of a hypothesis (Bowma and Atkinson 1995). The element which does the causing is called an "independent variable", while the element which is acted upon, produced or caused by the independent variable is called a "dependent variable". An intervening variable is a process that helps to explain linkages between dependent and independent variables and can cause the relationship between them to change. These three types of variables could be plotted into diagrams for each research. Bowma and Atkinson comment that the possibilities of such diagrams/models are endless. They say that while the most complex theories can be diagrammed, most research projects deal with only one small aspect of the whole diagram. It is often a useful discipline to diagram more than you plan to study in order to show where the proposed research fits in the larger frame of reference.

The theoretical / conceptual framework can either:

i. Be a self - designed framework which can be formed as a result of a literature search coupled with informal interviews with persons who have a wealth of knowledge about the subject area.
ii. Use a previous theoretical / conceptual framework.
iii. Modify an existing framework.

## 3.12) Questionnaire Design

It was important that the study produced reliable and accurate

information; consequently, extensive consideration was given to the design of the study. Having regard to the nature of the information being sought, questionnaires provide a sure way to determine the view of the parties to a project to the types and weight of association of construction claims on their projects. When properly designed, questionnaires provide an acceptable level of objectivity, and when carried out in sufficient numbers will provide an acceptable level of statistical reliability. The research objectives together with the literature review would lead to the issues, topics and ideas to be addressed in the research; these would lead to the questions that are to be included in the questionnaire. This is the standard flow leading from top to bottom in the research life span. The following is a diagram (Figure 3-3) from Naoum (1998) showing the translation of research objectives into specific questions.

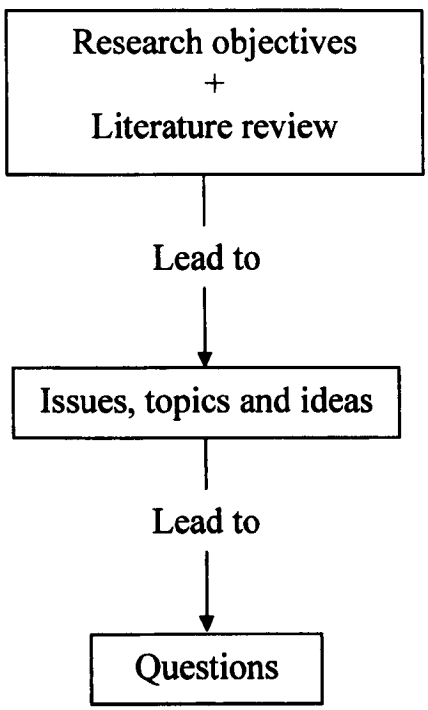


**Figure (3-4) A diagram showing that during the research process, research objectives are translated into specific questions, source Naoum (1998) page 66**

Closed ended questions were designed to increase the possibility of getting true answers and to minimise the personal effect in them. Questions on the kind of party to a project, size of the project, and ownership type were all of this kind. A rating scale format was chosen to ask the respondents about their opinion of the association of the claim in the project. This was on a scale of one to five (five being the strongest association). Some clarifications were put beside some questions to ensure that all respondents had the same and full understanding of all the questions. Great care was taken to ensure the neutrality of the questions and that none of them will lead the respondents to a specific answer, and recognising this issue, each question was deliberately phrased and expressed to avoid any indication of the desired outcome. Similarly, the structuring of the questionnaire and the ordering of the questions within, were carefully considered to avoid the development of particular themes, which could potentially lead to the respondent providing a series of responses that were consistent with each other, rather than genuine. The respondents were given the chance to add any claims they knew of in their projects that were not included in the questionnaire. Although the questionnaire included eighty two claim causes (see Appendix page 410), yet the respondents were given that chance in order to enrich the research with adding their personal experiences. The construction of the questions was important to ensure that the phrasing, language and words used will be clearly understood and relevant to the respondents. Experience of the researcher in working in this sector of the industry on-site and in the head office for a number of years provided the experience necessary to ensure that the questions related to the industry's standards and to the respondents' professions. To check that the phrasing was perceived as intended, the questionnaire was piloted on a number of respondents from the three categories of project parties (owners, contractors and

consultants) and the questions refined and altered when necessary. The pilot study also tested whether the questions did in fact address the issues that they were intended to address, as well as whether responses would be forthcoming. On both counts the questionnaire was successful and was amended in response to the responses received. Long and complex questions were not used to avoid multiple issues being included in a single question, which would probably produce uncertain responses. Each question was so designed to require a single response to a single issue. The pilot study and the research were carried out during a stable period of the construction industry. There was no recession, but there was no boom either. The economic situation in the country was on an average level, and that helped prevent the results from bias towards one end of the economical cycle. The sample was randomly chosen from the lists in the chambers of commerce of the three major cities in the Kingdom of Saudi Arabia (Jeddah, Riyadh and Dammam). One thousand questionnaires were mailed and one hundred and one responses received. The acceptable filled-in questionnaires were one hundred. This low rate of responses is not uncommon in Saudi Arabia, but is low compared to that in Britain. The sample of firms provided a representative cross-section of the industry, being of various sizes, locations and specializations see (Tables 3-5, 3-6 and 3-7). These did not resemble an identifiable sector of the industry and did not therefore bias the results in any way. A major objective of the study was that it must be reliable and representative. To meet this objective, a number of considerations were involved. The size of the sample was important to insure that both the reliability and accuracy of the responses would be within statistically acceptable limits. Initially a sample size of around eighty was intended. A second consideration was the constitution of the sample in terms of the parties to the project. The mail shots were equally divided between the three parties

to the project in almost equal quantities. The geographic factor was taken in consideration too and the questionnaires were sent to the three major cities in pro-rata of their populations. In the analysis of the results no imbalances occurred and no corrective action was undertaken to redress the balance. In view of the above construction, the sample was viewed as statistically acceptable and representative of the local construction industry in Saudi Arabia. The three cities where the respondents lived made up 50% of the population of the country and were regarded as representative of the whole population, especially that over 70% of the contracting companies are based there. No owner, contractor or consultant was deliberately excluded and the researcher had no control over which firms would participate in the research.

### 3.13) Data Collection

The data collected using the survey approach are called primary data because they are obtained first hand, while the date collected using the desk study approach are called secondary data because the data are obtained from other sources (Naoum 1998). He states that the postal questionnaire is probably the most widely used data collection technique for conducting surveys. It is most suited to surveys whose purpose is clear enough to be explained in a few paragraphs of print, in which the scheme of questions is not over-elaborated. Postal questionnaires have been widely used for descriptive and analytical surveys in order to find out facts, opinions and views on what is happening, who, where, how many or how much. Almost all postal questionnaires have closed-ended questions that require a specific response such as yes or no or ranking the importance of factors.

The main advantages of postal questionnaires are:

1. Economy: it suits assembling a mass of information at a

minimum expense in terms of finance, human and other recourses.

2. Speed: first returns and reminders would take around four weeks, which is not a long period in the research life span.
3. Consultation: in certain cases respondents may not have the information in hand, particularly when the questions are of a quantitative nature, and may need to consult a document or a colleague in order to give accurate answers. Such questions may have to be answered in the respondent's own time, rather than provided on the spot as usually associated with interviews.

Naoum (1998) notes that selecting the research sample is very important and great care must be taken when choosing the type of sample design. The researcher has to ensure that the characteristics of the sample are the same as its population as a whole. Usually, the means of drawing a representative sample is done either randomly or non-randomly, the term 'random' means selecting subjects (respondents) arbitrarily and without purpose. Naoum stated that random sampling can be used when specifics about the characteristics of the sample are not essential, such as background of respondents, size of company and type of work, etc. However there are two main criteria that one needs to take into consideration when selecting the sample:-

First: What does the researcher want to know?

Second: About whom does he want to know it?

Both of these questions can be answered by referring back to the purpose of the study i.e. the aim, objectives and hypothesis (or key questions).

Two steps are to be followed in order to draw a random sample:

1. Identify the population from which the sample is to be drawn.

This means obtaining a list of names and addresses.

2. If the list is small, one may be able to send the questionnaire to all the names identified in the list. If the list is long, one needs to device a method of random selection which ensures that each subject has the same probability of selection.

Nachmias and Nachmias (1996) noted that the personal interview is another major technique for collecting factual information as well as opinions. It is a face to face interpersonal role situation, in which an interviewer asks respondents questions designed to elicit answers pertinent to the research hypothesis. The question, their wording and their sequence define the structure of the interview. Naoum (1998) notes that interviews can take three forms; unstructured, structured and semi- structured. Some research may require one form of interview, while others may require a combination of the three forms. There are many other terms in use to distinguish between what are called here structured and unstructured interviews. For example, there are formal and informal, inflexible and flexible, standardised and unstandardised, controlled and uncontrolled interviews. The following is a (Table 3-9) from Naoum (1998) comparing the features of postal surveys and interview techniques.

| | **Features** | **Interviews** | **Postal questionnaires** |
|---|---|---|---|
| 1 | Identify of respondents. | Known. | Unknown. |
| 2 | Interaction between interviewer and respondents. | Close. | Distance. |

| | | | |
|---|---|---|---|
| 3 | Time involving the researcher. | Long time to go through the interview. | Short time. |
| 4 | Cost. | High. | Significantly lower than the interviews. |
| 5 | Sample. | Small. | Large. |
| 6 | Quality of information. | Deep and detailed. | Rich. |
| 7 | Skill and experience. | The interviewer needs to have the skill to ask questions and, if necessary, to probe. | No skill required. |
| 8 | Control of the process. | High. | Low. |
| 9 | Flexibility. | Allows greet flexibility to reward questions and clarify terms that are not clear. | Rigid. The answers are accepted as they are. |
| 10 | Analysis of the results. | Difficult and become complicated in the unstructured interviews. | Easy to analyse. |
| 11 | Interviewer bias. | The flexibility of interviews allows for bias. Sometimes the non-verbal communication or behaviour of the interviewee may mislead the interviewer to incorrect judgment. | If sample is selected appropriately, there should be no bias. |

**Table (3-9) Comparison between a postal survey and an interview technique from Naoum (1998).**

### 3.14) Pilot study

Naoum (1998) noted that it is advisable to complete a pilot study before the researcher collects the final data from the whole sample. A pilot study provides a trial run for the questionnaire, which involves testing the wording of the questions, identifying ambiguous questions, testing the technique that you use to collect the data, measuring the effectiveness of your standard invitation to respondents, etc. Bell (1996) described a pilot study as getting the bugs out of the instrument (questionnaire) so that subjects in your main study will experience no difficulties in completing it and so that you can carry out a preliminary analysis to see whether the wording and format of questions will present any difficulties when the main data are analysed. In this research a pilot study was completed with a small number of questionnaires being sent to some professionals as a trial run. It was found from the feedback on these responses that some questions were not fully understood by some of the respondents. Other found some difficulty in filling in the whole questionnaire, on the basis that it was a long one. Some complained of the difficulty of understanding the meaning of some words (as technical words in Arabic are somewhat different in certain geographical areas of the Arab World from where the majority of the technical Arab work force in Saudi Arabia come). Some corrective effort was put to the questionnaire with the aim of making it fully understandable to all Arabic speaking respondents by using synonyms of technical words, were possible, and rephrasing other questions to simplify them. The length of the questionnaire was not cut but a note in the accompanying letter asked respondents to be patient and fill in the whole questionnaire, stressing that their effort would be helpful in addressing the problem in hand. (Arabic version is included in the appendix to this thesis). A modified version of

the pilot questionnaire was sent out to one thousand addresses and the response showed that the sample had more understanding of the questions compared to the initial pilot questionnaire.

### 3.15) Limitation to the study

Several limitations to the research and hardships were encountered. Time, manpower and financial means were all limited, which set the context for the methodological approach. The subjects of the study (respondents) were not physically accessible; they were spread in a country of two million square kilometres, or the size of Western Europe. The respondents will rate the weight of the association of claims in their projects depending on their own experience and judgment, and the survey likely to produce fairly shallow information (although from a relatively large sample). Naoum (1998) noted five main limitations for postal questionnaires:

1. Must contain simple questions which can be answered with the aid of easy instructions and definitions. The question should be very carefully worded and free from faults such as ambiguity, vagueness, technical expressions, difficult questions and so forth. These faults can affect the result of the postal questionnaire even more seriously than when conducting an interview.
2. Inflexible technique in the sense that postal mail questionnaires do not allow the opportunity for probing. In other words the answers have to be accepted as final and there is no opportunity to clarify ambiguity or to appraise the non-verbal behaviour of respondents, though the latter can sometimes create bias.
3. Accuracy: respondents may answer generally when one is seeking a response on specific level of analysis. People may also answer according to what they think the researcher wants to hear. They

may answer according to their public profile rather than the underlying corporate reality.

4. No control over respondents. This means that although the researcher states in his questionnaire that a particular person should complete the questionnaire (such as marketing director, managing director or the site agent), there is no guarantee that this statement will ensure that the right person completes the questionnaire. However, this is less of a problem than not getting a response at all, given the fact that response rates of postal surveys usually range between 40 and 60 percent.
5. Industry fatigue: companies receive a steady stream of questionnaires, and the pressure of modern business means that for many organizations and individuals, students' questionnaires are of less priority.

Buchanan et al (1988) note that field work is permeated with the conflict between what is theoretically desirable on one hand and what is practically possible on the other. They acknowledge that members of an organization can block access to information, constrain the time allowed for interviews, lose questionnaires, go on holiday and join other organizations in the middle of a study. Bryman (1988) comments on industry fatigue by saying that the novelty of being a research subject in the early 1960s helped researchers gain entry to organizations. Indeed this may also have been the situation within the construction industry during the 1980s. However the growing band of construction researchers and their request for co-operation often place demands on companies and individuals which cannot be fulfilled. The low response rate in this research could well be due to the industry fatigue, but is also due to the low rate of response to questionnaires in the Saudi construction industry

compared to the UK and noticed in previous research. This industry is made up of 90% of expatriates who might not always be keen to support research efforts and might not stay long in the country to receive a copy of the results of the study, or see the results or recommendations being implemented. Some responses of the questionnaire might be misleading due to some respondents' tendency of fear to express opinions that may be considered to be against their companies' views. This could also arise from the mistaken belief that their response could be contrary to their loyalty to the company, or due to fear of losing their job. To cover this sensitive issue, no names were required written in the questionnaire

## Statistical tests

The chi square non parametric test was applied to the data to make sure that the results were not due to either error or chance. The special computer package called SPSS was used and results are included in the appendix to this thesis.

## Summary

The collected data was analysed by counting the frequencies of claim associations in each variable cell (variables are ***time*** , ***money, operation, quality, function, life expectancy, reputation*** and ***future relations***) in the frequency distribution tables (found in Appendix C of this thesis) and the weights were normalised by dividing the total weight of association by the number of questions in each section of the questionnaire to get the normalised weights of each claim association. Those will appear as numbers in brackets in the next two chapters.

## Chapter 4

## Association of the six groups of claims with the Eight Variables Regarding Ownership

### Introduction

The purpose of this chapter is to discuss the association of the eight dependent variables, coming out of the literature review, with the different groups of claims regarding the ownership of a project (owner, contractor, and consultant). The eight dependent variables were grouped into three groups: the process group (the time and money variables) product group (the operation, quality function and life expectancy variables) and the business consequences group (the reputation and future relations variables). The association with each of the variables and each of the groups will be discussed. This chapter is speculating on the causal relationships between the factors, and explanations of the data are drawn from personal experience. It is theoretical base is an "interpretent" model of research by the observation of what "is", followed by an interpretation of the phenomena. The data comes from the analysis of the responses of the questionnaire and the weight of association shown in this chapter are calculated as the normalized weights from the collected data.

The following is a discussion of the association of the six groups of claims with the eight variables (***time, money,*** etc...) regarding ownership of a project (government or private). The six groups of claims, under which all claim causes in the questionnaire were grouped, are as follows:

- 'Information and technical' – based claims
- 'Contract administration' – based claims
- 'Market – driven' claims
- 'Man – made' claims
- 'Site conditions' claims
- 'Acts of God' claims

The following is a discussion on each group independently:

**4.1) 'Information and technical – based' claims:**

The data show that the association of impact on ***time*** is the largest among the eight variables. This group of claims contains claim causes such as poor workmanship, poor technical skills by any party to the project, disputes on variation orders' timing and costs, delay in approvals of drawings, schedules, material, work performed or tests. It also includes mistakes in specifications, delay in submittals ( by any party ), poor submittals, poor design or detailed drawings. If is evident from the data that there is a great impact associated with claims on ***time*** by those claims grouped in the 'information and technical-based' claim causes. The associated is high on both types of ownership (government and private) with the impact on government projects slightly higher than that on privately owned projects. Evident from the data that there is a problem of poor workmanship and poor technical skills in Saudi Arabia. This could be due to that skilled and unskilled labourers are 95% expatriates and there are no rules governing the immigration of this labour force in terms of skill or technical knowledge and expertise. Any labourer can be granted an entry visa if only his passport says that he is a skilled labourer in a certain trade. No other restrictions or qualifications are required to issue a visa for a skilled labourer. To add to the problem, the skilled and unskilled labour force in Saudi Arabia come from 95 different nationalities with all what that means of differences in levels of skill, and cultural differences leading to different approaches on productivity, customer satisfaction and the need for self improvement. Part of the poor workmanship problem could be attributed to consultants, either through poor supervision or due to consultants being under paid. The law regulating consultants work does not mandate any technical qualification other than having a degree in engineering, thus giving the chance to any one with an engineering degree to be a consultant just three years after the date of graduation. There is still no professional body to regulate and put the right and

appropriate standards for the profession. More over there are no minimum fees for consultancy work and the government procedures help aggravate the problem by accepting the lowest bidder to consultancy work, irrespective of how low the fees are, especially that there is no code for the consultancy profession. Owners in the private sector too help in taking fees down further by asking consultants for abridged tasks of supervision, like only visiting the site once or twice per week. There is even a regulation that buildings of two stories or less are exempted of having to be supervised by a consultant. The usual government procedure of accepting the lowest bidder and not judging bidders by their technical standards is still largely contributing to the problem of poor quality work and poor workmanship. Saudi Arabia still lacks an index of construction labour, machinery and material prices. Perhaps having one in the future can help take construction prices to the limit where every contractor can give his best service and not leave construction prices to drop to levels of today, where contractors compete with no regulation and take down with them the level of workmanship, which will inevitably have its negative effect on the whole economy in Saudi Arabia, by affecting the resale price of private property and reducing the life expectancy of buildings in the public and private sectors. This group of claim causes also includes disputes on timing and cost of variation orders. These claims could be due to that construction contracts used in public projects do not elaborate on these matters, thus making a problem every time there is a variation order. There is no approved form of contract usually used in the private sector of construction in Saudi Arabia. The FIDIC form of contract is used in the neighbouring Gulf countries, but it is not familiar in the Saudi market yet . Although it is the absolute right of the owner to a project to make variations to his project, yet it is his duty to compensate the contractor with the fair amount of money and, if needed, enough time extension. The problem with government agencies in Saudi Arabia is that they are usually reluctant to give any time extensions to contractors, whatever the reasons are. Their approach is to let the contractor if unsatisfied with the situation, to take his case to court,

namely the Board of Grievances, to judge if he is entitled to any time extensions in the project. This approach would undoubtedly make contractors inflate their prices to accommodate for such a risk. It will also, with no real need, put a burden on the court, that could have been minimized, had the government agencies done their jobs in settling contractors' claims built on extension of time, generally, and those built on extension of time due to variation orders. This information and technical–based group of claims also includes claims built on delay in approval of drawings, schedules, material, work performed or tests undergone. In public projects, owner representatives usually explain their delay in approval either by being overloaded with other work, or due to the governmental procedures, that could require the approval of the minister in charge for certain items. In the private sector, the case could be due to that the consultant does not have a resident representative on site, and that he is asked to visit the site only few visits per week, or due to that, the consultant is incompetent or careless, especially if there is no follow-up by the owner. This delay in approval will inevitably force the contractor to claim extension of time and compensation for costs incurred due to that delay. This group also includes claims built on poorly prepared specifications. This problem could be due to the poor level of consultants working for the public or private sectors. Being under-paid could also be the reason. A problem in the public sector is that in some projects specifications are used which belonged to other un-similar projects, with the purpose of cutting cost of consultancy fees. The problem could also sometimes be due to specifications being written by foreign consultants without visiting the country, and with little or no knowledge of the construction industry in Saudi Arabia. This group also includes claims on delay in submittals, which could be through any of the parties to a project, either through contractors and sub-contractors or through owners and / or consultants. Continuous education for all the parties is essential to minimize the effect of such delays on projects. Poor submittal is another claim cause in this category, which could also be due to either the contractor or the consultant. In either case, it is necessary to

upgrade the technical skills of the party responsible for poor submittals. The last of the claims in this group is around poor design and / or detailed drawings. The previous discussion on poor performance by consultants is applicable here. Consultants could be underpaid and sometimes, in rush projects, not given enough time to do their jobs properly. The problem is that the public and the private sectors see many of their projects as rush ones, and sometimes, with no real need to that. Haj (pilgrimage) related projects might have to be rush projects, either in the public or private sectors (like hotels and guest houses) but other projects do not have to be dealt with in the same manner as such projects. Another reason for poor design and / or detailed drawings is that there is no code to the level of details or what these drawings must have on them for a project to be successful. Some government agencies have their own standards, but each is working independently from the others, such that there is no universal consensus on how detailed drawings should be.

## 4.2) Discussion on the association of 'information and technical based' claims with the eight variables (*Time – money...*).

### 4.2.1) The Process Group

#### 4.2.1.1) The *Time* Variable

***Time*** was the most associated with the eight variables in government projects (8.47) slightly higher than private ones (7.79) weighed impacts. It is evident from the data that 'information and technical' based claims have a disastrous implication on time of a project. Time claims are ones of the most common cases in Saudi courts, whether in public or private projects. Unfortunately, such cases take years to be settled in courts due to the lack of knowledge from most experts at counts in the technical methods to deal with time related cases and claims. Judges, as non-experts themselves, might add to

the delay of cases by either trying to resolve the puzzles of time claims themselves, or appointing unqualified experts to give expert witness on the matters at hand. There is no universally accepted way of choosing experts to the court, but rather every judge has the right to choose by the way he thinks is best. Some judges request that chambers of commerce appoint the expert, while others could either appoint one they knew before and have confidence in, or leave the matter to the claimant and defendant to choose among them whoever they agree upon.

#### 4.2.1.2) The *Money* Variable

***Money*** is the second highest variable that the data showed was associated with the 'information and technical-based' claims. Still government projects (7.92 weight of impact) were slightly more than private projects (7.02). The ***money*** variable was only 9% less associated than the ***time*** variable, yet these two variables were the most impacted of the eight variables to be discussed in this chapter. Money claims are the most popular in Saudi Courts. Time is mostly evaluated into money. Delays in approvals or submittals will surely end into money-based claims. In addition, poor technical skills by any party to the project and poor workmanship will inevitably have their effect on money-based claims. The loss of money by one or more party to a project is also due to disputes on variation order timing or pricing. The effect of poor design or detailed drawings evidently will cause the contractor to claim money for compensation. The two previous variables ( ***time*** and ***money*** ) make up the process of a project.

### 4.2.2) The Product Group

#### 4.2.2.1) The *Operation* Variable

Discussing the following four variables ( ***operation, quality , function*** and ***life expectancy*** ) which make up the product of the project, it is observed from the data that ***operation*** of a project is the most associated variables of these four.

Again, here we notice that government projects (6.21) are slightly more impacted than private projects (5.89). The ***operation*** of a project might be delayed due to the delay in the delivery of the project, which is mostly due to the delay in submittals and approvals. In addition, effect on ***operation*** might be associated with poor workmanship and poor technical skills of one or more party to the project. It could also be associated with mistakes in specifications, which could result in rework, thus affecting the ***operation*** in a project. Poor design or poor detailed drawings could also effect the ***operation*** of a project through delay or rework to correct work done wrongly due to the faulty drawings.

#### 4.2.2.2) The *Quality* Variable

The next variable is that of ***quality***. Here the pattern seen in the previous variables is reversed and private projects (5.48) are slightly more impacted than government projects (4.97). It is quite logical that effect on quality of work or of a project must be associated with poor workmanship, or poorly produced design or detailed drawings. It might as well be associated with the poor technical skills of one or more of the parties to a project. Mistakes in specification can easily affect quality in a project, which might also be associated with disputes over variation order pricing in the sense that a contractor, if not paid properly for the additional work, might produce substandard or defective work. Although the difference in association between private and public projects in not significant, yet it might be due to that some private projects are not supervised at all by consultants, which is not the case with government projects.

#### 4.2.2.3) The *Function* Variable

The third variable in the product group of variables is that of ***function*** of a project. The data show that this variable is the least associated with the 'information and technical-based' claims. Here, too, private projects (3.72) show slight more association than government projects (3.58). The ***function*** of a project might be associated with poor workmanship, or poor technical skills by

one or more party to a project. It could as well be associated with mistakes in specification, or by poor design or detailed drawings. Because ***function*** of the project might only be associated with the previous claim causes and not by all the claim causes in the 'information and technical-based' group of claims, this might be why it scored the least association in all the variables.

#### 4.2.2.4) The *Life Expectancy* Variable

The last of the product group of variables is that of ***life expectancy*** of a project. It scored slightly more association than that on ***function***, with private projects (3.87) slightly scoring more association than government projects (3.79). ***Life expectancy*** of a project must surely be associated with poor workmanship or poor technical skills of one or more party to a project, mainly the contractor. It might also be associated with mistakes in specifications and poor design or detailed drawings, which certainly will affect either structural or electro-mechanical work, and that will consequently be associated with the ***life expectancy*** of a project. Other claims in this group, such as delays or disputes over variation order timing, might not be associated with this variable, although it might be associated with disputes over variation order pricing, when a contractor might perform defective work if he feels that he is not properly paid for that work.

### 4.2.3) The Business Consequences Group

#### 4.2.3.1) The *Reputation* of the Parties variable

We now come to discuss the third, and final, group of variables, which is the business consequences group (***reputation*** of the parties to a project and ***future relations*** of these parties). ***Reputation*** is relatively highly associated with government projects (6.0) slightly more associated than private ones (5.53). In government projects, the reputation of contractors or consultants might be at risk. The owner (government) feels it is not at risk because it is the largest

employer in the industry, and contractors and consultants will keep working for it anyhow. This might be partly true but it will be certainly at a higher cost for the government. Contractors and consultants will most likely raise their fees when they know of the reputation of the government as a difficult client to deal with. The reputation of one or all three parties to a project might be affected by poor technical skills, poor workmanship, and delays in approval of drawings, schedules, material, or work done. The reputation of consultants might be affected by claim causes such as mistakes in specification or poor design or detailed drawings. The government already has a bad reputation concerning disputes on variation order timing and pricing. Contractors, too, might be seen as claim initiators if they gain this through over claiming time or money for the variation orders, thus gaining negative reputation.

#### 4.2.3.2) The *Future Relations* Variable

The second of the business consequences group of variables is that of ***future relations*** between the parties to a project. This variables is almost associated the same as the ***reputation*** variable, with government projects (6.02) slightly more associated than private projects (5.42) ***Future relations*** in government projects are usually governed by the bidding procedures which allow any contractor to bid in any government project under five million Riyals, and any contractor to bid in a project over five million if he is approved to do so as per his qualifications. The only time a government agency can neglect a contractor due to bad relations with this or other government agency, is in closed bids, where only a small number of contractors are invited or short-listed. The matter is easier for private owners, where they are not governed by bidding laws, and it is all up to them to invite whom they wish to. ***Future relations*** could be negatively affected by claims on poor workmanship, or poor technical skills. Especially for consultants, they could have negative future relations with owners through claims on mistaken specifications or poor design or detailed drawings, delay in approvals of drawings, schedules, material, work performed

or tests. Contractors can have bad future relations with owners through claims on disputes over variation order pricing or timing and poor submittals too.

The previous pages were a discussion of the association of 'information and technical-based' claims on the eight variables which were grouped in these groups (process, product and business consequences to a project). It has been shown that the process group (***time*** and ***money***) was the highest associated, followed by the business consequences group (***reputation*** and ***relations***). The least affected group was the product group (***operation, quality, function*** and ***life expectancy***). The difference in association between government and private projects was slight with government projects scoring higher association in five out of the eight variables.

## 4.3) 'Contract Administration' Group of Claims.

### 4.3.1) The following is a discussion of the association of the contract administration group of claims with the eight variables (*time*, *money* etc...).

This group of claims contains claim causes such as poor coordination between contractors, delayed payment by owner, delayed handover of site to contractor, work stoppage by owner, disputes on owner – caused delays, owner – directed acceleration, reasonable time extensions, variation order pricing and timing, late payment of variation orders, uncooperative consultants, poor documentation, lack of dispute resolution method in contract, poor contract documents and problems arising from nominated subcontractors.

#### 4.3.1.1) Asocition of the 'Contract Administration' claims group with *Time*

It is obvious from the data that the ***time*** variable is the most associated with this claim group. The association with government projects (4.34) was

slightly higher than that on private projects (4.06) . Poor coordination between contractors will surely be associated with ***time*** whether coordination was by the main contractor to his sub-contractors, or by the owner to several main or sub-contractors. This case is not valid for government projects where all projects are awarded to one main contractor, but rather it will be the main contractors problem of managing his subcontractors. The claim cause of delayed payment by owners will no doubt cause an association with time in a project whether public or private. Yet government contracts do not allow contractors to stop the work if the owner delays payments, but a contractor can, after finishing the job, claim whatever consequences delay had on him. The philosophy behind the government position is that it is dealing with projects of public benefit and a contractor should take into consideration the possibility of delayed payment in the project. Sharia law applicable in Saudi Arabia does not allow for automatic compensation for delayed his payments on an interest basis, but rather allows for payment of damages that were incurred by a contractor in the cause of trying to finance his project when the government delayed his payments. Resorting to borrowing from banks using interest is not acceptable as a cause of reimbursable damage, but rather getting financing through banks dealing on Islamic economic bases of partnership or other forms can be an accepted approach for collecting damage of delayed payment in Sharia Courts. In private contracts, the matter is usually easier, where contracts could contain clauses helping contractors to mitigate their losses by either slowing down the pace of work on site, or even totally stopping the work if the owner delayed a payment. Delayed handover of site to a contractor is evident to be associated with the project's time. This problem is more from the government side than private projects. There are times when there is a divided handover for multiple sites in a town or several towns, or handing out a part of the site in other projects, where there is a problem with a part of the site. This is quite common in refurbishing and renovation projects, where the owner some times cannot handover some parts of the site due to its occupation. Work stoppage by owner can be associated the time variable too.

The meant stoppage here is one due to owner's circumstances and not one included in the contract, such as stoppage for faulty work performed by a contractor. There is still an association with ***time*** even it the owner gives a reasonable extension of time due to stoppage of work from his side. The effect is on the learning curve and time needed to gather other or same teams of labour, especially if there were more than one stoppage, or it was a long one. Highly qualified labour is hard to find at any time, and it takes some time to find good labour. Disputes on owner – caused delays can have a negative effect on ***time*** in a project. These delays can have several causes. In government projects, it can be due to late approvals or late provision of necessary information. The same applies to private projects. Rarely will the government as owner accept giving a contractor extension of time due to owner–caused delays. That is why most contractors have to go to court (The Grievance Board) to ask for compensation or extension of time. In the private sector, the matter is easier to deal with, as owners can compensate their contractors easily without going into complicated procedures as is the matter with government agencies. Less educated owners in the private sector always think they are right and the contractor is always wrong, thus aggravating the situation of owner caused delays. Disputes on owner–directed acceleration can negatively affect time in a project, when completion dates are crucial and must be met, owners sometimes direct contractors to finish on time, irrespective of who was the cause of the delay that happened, be it the owner, consultant, or a third party. The contractor will incur some expenses due to working over time and multiple shifts, and his productivity might be negatively affected. If the owner is not ready to compensate the contractor for such expenses, probably the contractor will not be able to complete the job on the required time. Projects related to Haj (pilgrimage) have critical final hand over dates and whether in government or private projects, owners will want their projects delivered or time, irrespective of what or who caused the delay to the contractor. If this matter is not resolved on time, it could affect the ***time*** of the project and the contractor might not finish on time. Disputes on reasonable time

extensions have their association with ***time*** of a project. The government is very tough on matters of time extension, and contractors usually have to go to court to get back penalties that have been deducted from them, or even some compensation. Unless the project is related to Haj, private owners are more lenient than government agencies in this matter. If a contractor is not satisfied with a reasonable time extension, he might not finish on time. Disputes on variation orders are a major claim from contractors against owners. The disputes are on the reasonable market value of the variation order, timing, and late payment of variation order work. If contractors are not satisfied by getting what they are entitled to as cost of the variation order work, they might not finish on time due to financial problems, especially if the amount of the variation order(s) was huge. Timing of a variation order is a critical issue too. Some owners give variation orders during the final stages of work, which could create some problems to the contractor. Untimely variation orders have to be well evaluated by owners before they order contractors to perform them. If a variation is on the critical path of a project schedule, it might cause a delay to the projects. Private project see more untimely variation orders than government projects do, because the input of private projects owners is far more than that in government projects where most of the projects are typical buildings that have been constructed several times before, whereas private projects have owners that want their personal touch evident in their projects. Late payment of variation order work could also put a contractor in financial problems, thus affecting the time of a project due to that the contractor finished late because of his financial problems due to the late payment of the variation order work. The government has gained a reputation as a late paymaster. The same applies to additional work. Too many variation orders could also be a problem in construction either in government or private projects. The claim on consultants being un-cooperative could be associated with the ***time*** variable in a project. If a consultant is un-cooperative, he might delay inspection of work done or delay approvals of submittals or he could also stick to certain brand names in the bills of quantities and not accept

any other equal brand names. All of this might cause a delay and can be associated with the ***time*** variable of a project. Some less educated owners think that a stiff and uncooperative consultant is the best for their projects. This kind of consultant can be found in both government and private projects. Claims based on lack of a contract to methods of dispute resolution can be associated with ***time***. If a proper method of resolving disputes is missing from the contract, each party will suggest the method it thinks is best for it. Owners or contractors will explain the contract clauses to their benefit and it will take too long to agree on one method of resolving a conflict. This will undoubtedly affect the ***time*** and a contractor might overrun the completion date in the contract due to those unresolved disputes, or due to that they took too long to be resolved. This matter can happen in private contracts, where owners or their agents draft their own models, not using a known model contract. In government projects, disputes are either amicably settled within a certain period, or the dispute is taken to the Board of Grievances to be settled there. It could take years to settle a dispute this way. Nowadays there is a tendency in the private sector to use arbitration as a quick method of resolving disputes between owners and contractors or contractors and sub contractors or even between owners and consultants. The government is very slowly exploring arbitration in BOT projects, but all other projects have the same old methods of dispute resolution. Claim causes built on poor contract documents may as well be associated with the ***time*** variable of a project. Ambiguous wording of a contract or contract document, such as bills of quantities or specifications, can cause a dispute between the contractor and owner and / or consultant. This dispute could cause an be associated with ***time***, and delays to the work until things are clarified, and ambiguities resolved. Incomplete contract documents could also be associated with time until clarifications are made to make up for the incomplete information. These could be incomplete bills of quantities, specifications, drawings or addendums to the contract. Contradicting contract documents could also have an be associated with time. Contradiction could be in the contract clauses, or in the detailed

drawings, or in the specifications, or in the bills of quantities, or between any of the previous mentioned documents. The last of the claim causes in this group of contract administration claims is that of disputes over nominated sub-contractors. In some instances, owners for their own reasons, or for the benefit of the project, may nominate one or more sub contractor with whom the main contractor must get into agreement to work on the project. When sometimes these nominated sub contractors cause any problems with the main contractor, the latter will try to make the owners involved and may blame them for choosing such a subcontractor that is making problems to him. This cause of claim may have its negative effect on the ***time*** factor until such problems are solved. This problem is primarily a private sector problem as the public sector seldom appoints a certain contractor as a subcontractor in a project, except in very limited instances, such as expansion projects, were the contractor should use the same sub- contractor for say electronic or audio-visual systems as the existing building, to avoid having to deal with two brand names after expansion in maintenance and operation. In the private sector, owners can freely nominate their selected subcontractors with no restrictions. A law that prohibits naming brands or makes in specifications or BOQs in government projects controls the public sector. Literature on this subject shows that nominated subcontractors are the sole responsibility of the main contractor, who could have rejected them before signing the contract, or even raise the matter with the owner if the main contractor knew of the bad performance or financial problems of the subcontractor. If the owner insists on his nominated subcontractor, the main contractor could refuse going into contract, but the moment the contractor signs the contract, the nominated subcontractor will automatically be his responsibility, like all other subcontractors.

#### 4.3.1.2) Association of the 'Contract Administration' claims group with *Money*

The data show that the ***money*** variable in a project is the second most associated with this claims group. The association with government projects (4.26) was almost 13% higher than that on private projects (3.77). Poor coordination between contractors, which is the main job of the owner / consultant or sometimes the contractor who manages his sub contractors, this cause of claim may surely have an association with ***money*** in a project. This poor coordination might cause delay of one or more contractors in the project. The ultimate effect on ***time*** might be inevitable. As previously said, this is a problem mainly in the private sector, but it could happen in public projects between the main contractor and his subcontractors. Delayed payment by owners will certainly have an be associated with ***money*** in a project. Although government contracts state that contractors have no right to stop the work if payments are delayed, yet in practice many contracts are delayed and run behind schedules because of delayed payments. It is the same with private projects, although in the last decade private project owners are better paymasters than the government, who ran into some financial difficulties after having to spend heavily on the second gulf war in the early 1990s. Delay in handover of a site to a contractor might also have an association with ***money***. A contractor will incur some fixed expenses due to this delay. In big projects this can be a huge some of money. A contractor claimed expenses for a delayed handing over of a large project at the Board of Grievances. The claim amounted to 100 million Saudi Riyals (around 27 million US Dollars). This claim almost amounted to 20% of the contract value. This matter of delayed handing over is more common in the public sector projects, although it is not uncommon in the private sector too. Work stoppage by owner might have an association with ***money***. A contractor will loose some money due to loss in productivity due to stoppage and restart of the work force. The learning curve will be disrupted too, causing further loss in

productivity. If the owner will not compensate the contractor for the expenses incurred during the stoppage period, this will aggravate the loss of money to the contractor. This cause of claim might arise in government as well as in private projects. The matter of work stoppage by owner is somewhat clearly covered in the public works contract, but it is not so in many private sector projects. Less educated private owners think that they have the right to stop the work any time without compensating the contractor. To the contrary, institutional private owners and the well educated will undoubtedly understand the danger in stopping the work and are ready if they had to stop the contractor, to compensate him for his costs or losses. Disputes on owner caused delays might have its an association with ***money***. The public sector seldom will confess that it was the cause of a delay to the contractor, who has to go to court to get back the amount of penalty imposed on him or the fixed costs he has incurred. In the private sector, some of the owners might be cooperative and settle such disputes in a timely fashion. Most of the others will have the same position as that of public sector owners, and that is the denial of the contractor to any compensation due to a delay by the owner. A delay will cause the contractor to face more than budgeted fixed costs, which he sees unfair not to be compensated for. It is the role of construction professionals to educate all parties on their rights and obligations in this matter. The claims on owner-directed acceleration will be associated with ***money*** on a project. If the date of handing out the project cannot be postponed even if there is a delay by the owner himself or a third party, then the owner will direct the contractor to finish on schedule, even though there was some delay not due to the contractor. A contractor here is obliged to charge his batteries, work overtime, multiple shifts, some at night, and work on weekends and perhaps on religious holidays as well. This will cost money and will affect the productivity of the contractor through stacking, enlarged work teams and overtime work. All this will be translated into money, which the contractor will claim from the owner. Owners' position is always with denying any right to the contractor to claim for compensation, as the amount of work to be performed is

the same and disregarding any claims on lost productivity or acceleration cost. Owners have the same position whether in public or private projects. It will take some time for owners to be educated on such matters. Claim on reasonable time extension might be associated with money. If the owner or third party delayes a contractor due to any one's action, he is entitled to an extension of time. If he is not granted a reasonable extension he might finish beyond schedule, and as time is usually translated into expense, therefore the ***money*** factor in any project can be affected. The government, as mentioned earlier, is very tough on matters of time extensions, although in one instance, it granted the contractor an extension of time equal to twice the contract period, yet it refused to compensate the contractor for any additional expenses. The latter took the case to court where he was granted a compensation for time extension for delays not due to him. Time extension is also a problem in the private sector, although some experienced owners in this sector can understand the benefit of giving the contractor the reasonable time extension and the positive effect this attitude has on the project. Claims on reasonable market value of variation orders might have an effect on the money factor in a project. If a contractor is not reasonably and fairly compensated for variation orders, he might lose money or his profit in a project might not turn out to be as previously expected. In both cases, the ***money*** factor is negatively impacted. Some contract forms cater for this point and state that the contractor will not start work on extra work unless the owner and the contractor agree upon cost and time needed for this work. Unfortunately this in not the case with public contracts, and in most private sector contracts used in Saudi Arabia, this point is not at all addressed. Reasonable market value of variation order should take into account the stage of the project in which this order was given, the inflation rate since signing the contract, and the time it will take to finish this extra work. Timing of variation orders is a base for claims that might affect the money factor in a project. Variation orders are a common thing in construction, but if there are a lot of them, or they are being given untimely, this will create problems. If variation orders are given in an untimely fashion,

they will need more money and time than if they were given in a timely fashion. If an owner is ready to grant the contractor a reasonable time extension and the fair market price for untimely given variation orders, this will cause no problems. Such owners are rare. That is why there are many claims built on this cause. Owners in the private sector give more variation orders than those in public sector projects, yet both mostly always will not settle the matter fairly. Contractors would take their cases to court to get fair compensations. Construction professionals use their judgement in such cases more that they use data from the field. Most projects lack CPM schedules, and in the rare incidences that there are such schedules, they will not be regularly up dated as to show the real situation. Lack of such schedules and lack of construction professionals that are capable of using the necessary software to analyze such effect on time in a project due to untimely given variation orders, leaves professionals with no choice but to use their own judgement and expertise in deciding on such matters of dispute over untimely variation orders. It is evident here that contractors might lose some money due to untimely variation orders. The claim based on variation orders not being paid on time is certainly to affect the ***money*** factor in a project. The earlier discussion on delayed payments by owner is valid here too. Some owners, including government agencies, think that all variation orders are to be paid with the final payment, because there could be some deletion of work in the project and that will only be clear in the final payment. The public works contract is a re-measured contract and the government could be right if it wants to be on the safe side. Its contract puts a ceiling to extra work of 10 % of the contract value. In private projects, the case is different. It might be a lump sum contract, or the extra work exceeds 10% of the contract value. So paying for extra work at the end of the project is not a fair thing to do here. On the other hand, late payment of extra work might not be due to when is the time to pay for it, but it could be to that owners are usually late in payments, as is the case with the government agencies. Whatever the case, late payment of variation orders will have a negative affect on money in a project.

The claim on consultants being un-cooperative might as well be associated with the ***money*** factor in a project. It is clear that late inspection by consultants or late approvals of submittals by contractors will cause a delay to contractors. This delay is translated into money and extra fixed costs. Government agencies like tough consultants that are harsh on contracors and cannot distinguish between tough consultants and them being un cooperative. Private owners have the same position as government agencies in preferring tough consultants. It is not yet clear in Saudi Arabia as to what role the consultant should take. The British model is that of a neutral consultant that acts independently, but the American model shows a consultant that works as an agent to the owner, thus minimizing the neutrality of the professional. Government agencies want consultants under the American model, while in the private sector consultants are picking the model they see is more comfortable to them. Still there is no final say to this case. The claim based on that a contract does not specify any dispute resolution method might be associated with ***money*** as well as ***time***, as discussed earlier. If a dispute arises and was not dealt with because there was no clause in the contract to cover such a matter, this might delay the contractor until such a dispute is settled. This delay in time is always calculated in terms of expenses and profits. The money factor can also be affected if the parties agreed on a costly method to settle the claim, such as arbitration. Given that going to court is free in Saudi Arabia, this will make arbitration more expensive if, on both cases, we calculate the cost of solicitors. Resorting to less costly methods of dispute settlement like negotiation or mediation can save some money, although any method will cost the parties some money depending on the period it took to resolve the dispute. Claim causes built on poor contract documents might also be associated with the ***money*** factor in a project. Ambiguous documents or contradicting ones may need clarification, and that might take some time, especially if there are a lot of ambiguity and contradiction. If the contractor is delayed due to time consumed in clarifications, this will inevitably affect costs and the contractor will run over his estimated budget. If ambiguities or contradictions in the contract documents

are not dealt with on time, there might be extensive rework due to that. This will surely make a contractor incur extra cost and go into a dispute on who should bear these extra expenses. Incomplete contract documents have the same effect as ambiguous or contradicting ones. Poor contract documents are more common in private projects where there is no one inspecting the work of the consultant. Yet that discrepancy is also present in public projects. Claims built on nominated subcontractors might some times be associated with the ***money*** factor in a project. If the dispute over this point affects ***time***, as discussed earlier, this will surely have its effect on ***money*** as well. ***Time*** is always calculated in terms of cost and expense. This claim cause is primarily a feature of the private sector where owners are free to nominate whomever they wish to. The public sector is not immune to such claims, but it is on a largely smaller scale.

#### 4.3.1.3) Association of the 'Contract Administration' Claims group with *Operation* of a Project.

The data show that the 'variable *operation* of a project' is the third associated variable, after ***Time*** and ***Money***. Government projects (2.95) were slightly less associated than private projects (3.11), the difference being around 5%. In discussing the claim causes under the 'Contract Administration' group of claims, we see that poor coordination between contractors could be associated with the operation factor in a project. Poor coordination by the main contractor to his subcontractors could negatively affect the quality of work, and that in turn could affect ***operation*** of a project after its completion. Poor coordination by the owner to several main contractors could yield the same consequences. The effect on ***operation*** of a project could be on maintenance matters and regular day-to-day ***operation*** of the systems like HVAC, electronic systems such as fire alarm or mechanical systems such as fire fighting, elevators, pumps and stand-by generators. The claim cause of delayed payment by owner might be associated with ***operation*** in a project if the delayed payment put the contractor in a critical situation where he had to cut corners and that might have its impact later during

the operation of a project. The claim built on delayed hand-over of site to contractor might not be associated with ***operation*** of a project unless the contractor was obliged to meet a certain completion date irrespective of the site handover date. In such an incident, quality of the work might suffer and the future operation might be affected. The rush to finish the project might deprive the contractor from having the chance to shop around for the best brands of systems, and he might, for the sake of finishing on time, buy local available systems instead of importing better quality ones. The claim cause of stoppage of work by owner might not be associated with the ***operation*** variable in a project, and the same applies to other claims in this group like consultant being un-cooperative and contract does not specify dispute resolution method. The effect on ***operation*** will be due to that quality is associated with the claim causes under disputes over owner-caused delay, disputes due to owner-directed acceleration, disputes over reasonable time extension and disputes over cost and time compensation for variation orders. All of these claims might have an effect on the ***quality*** of work performed, either through putting the contractor in a poor financial situation or through forcing him to finish on a certain completion date irrespective of any delays by owner or a third party. The claim cause of poor contract documents, either ambiguous contradicting or incomplete might certainly affect the ***quality*** of the work and therefore will inevitably affect the operation of a project during its life cycle. The dispute over owner nominated subcontractor might as well be associated with the ***operation*** if the dispute was over quality or work performed by the nominated subcontractor. If quality suffers, the operational performance of a building will surely follow.

#### 4.3.1.4) Association of the 'Contract Administration' group with *Quality* of a Project.

The variable "*Quality*" ranks seventh out of eight variables in the association with the contract administration group of claims. Government

projects (1.84) scored slightly less than private projects (2.06). The difference is around 12% . The claim on poor coordination between contractors might not only have managerial or administrative consequences, but could as well have technical implications; ***quality*** could suffer. Delayed payments by owner could put the contractor in a financially bad situation, especially if a bank or financial institution does not back him, which is the case with a lot of contractors in Saudi Arabia. Banks only deal with big contractors and medium to small ones depend on their own resources to finance their projects. If the contractor suffers financially due to delayed payment by owner, his quality of work might suffer as well if he decided to cut corners, or try to avoid losing money by hiring a cheap workforce or supplying cheap material. Stoppage of work by owner could be associated with ***quality*** if this stoppage is long enough to let some material or systems on site suffer from weather conditions and they are not later dealt with wisely. If stoppage is for several times, the work force could change during stoppage time and ***quality*** might get affected. The dispute over owner caused delay or owner-directed acceleration or on reasonable time extension, all have the time factor in them. These claim causes could affect ***quality*** if time is not enough to complete the work in an acceptable standard. The contractor will have a choice of exceeding the handover date and going into penalty, or trying to finish on time, therefore risking quality that could be affected. The same applies to claims on disputed extension of time for variation orders. The claim built on a dispute over pricing of variation orders might be associated with ***quality*** too if the amount at stake is considerable in relation to the contract value. If the contractor is not satisfied with the compensation on variation orders, he might get into financial difficulties and try to cut corners, here ***quality*** will certainly suffer. The same thing applies to claims on late payment of variation orders. A claim on the consultant being un-cooperative might or might not be associated with ***quality*** depending on the effect of non cooperation, and if it did, or did not impact the technical role of the consultant. If only administrative problems arise, that will not be associated with ***quality***, but if technical problems arise as well,

then ***quality*** of the project could be at risk. A claim based upon the absence of any method of dispute resolution in the contract does not have any association with ***quality*** . A claim on poor contract documents that might be ambiguous, contradicting, or incomplete might surely be associated with the ***quality*** variable to a project. These contradicting or incomplete contract documents, if not dealt with in a timely manner, will surely be associated with ***quality*** on a project. Claims on disputes on a nominated sub-contractor could be associated with the ***quality*** variable if the dispute is over technical matters and poor work done or materials supplied by the nominated subcontractor. In other instances of dispute over administration matters or other matters away from the technical side of a nominated subcontractor, ***quality*** will not be at risk.

#### 4.3.1.5) Association of the 'Contract Administration' group with *Function* of a project.

The data show that the Contract Administration group of claims is associated with the ***Function*** variable of a project. It ranked sixth out of eight variables. Government projects scored (1.58) while private projects scored a weight of (2.74) and that is an increase of 73% over government projects. A claim of poor coordination between contractors may be associated with the ***function*** of the project if quality is affected too. In addition, the untimely order of variation could be associated with the ***function*** of a project if these are associated with quality too. A claim based on poor contract documents could also be associated with the ***function*** of a project as ambiguous or contradicting or incomplete contract documents that may include BOQs, drawings and specifications may have a negative out come on the project and its function after completion of construction. Government projects are much less associated with ***function*** than are private projects because a consultant supervises mostly all government projects, whether in house or an independent one. Small one and two storey buildings are exempted of having any supervision, and it is up to the owner to decide on whether he wants to hire a consultant for his small project.

Some private projects do not take enough time to be designed and could be designed cheaply at 0.5% of the construction-estimated cost. Such an approach will inevitably cause an association with the ***function*** variable.

#### 4.3.1.6) Association of the 'Contract Administration' group with *life expectancy* of a project.

The ***life expectancy*** variable is the last of the four variables that make up the process in a project. The data show that it is the least associated out of eight variables. Government projects (1.52) scored a weight of association slightly less that of private projects (1.85) . The difference is around 21%. ***Life expectancy*** could be affected whenever quality can be affected. So poor coordination between contractors, untimely variation orders, consultant being un-cooperative and poor contract documents can all be associated with the ***life expectancy*** of a project through affecting quality first. Other claim causes that are associated with ***time*** may have a negative effect on ***quality*** and then affect ***life expectancy***. These are claims like delayed payment by owner, delayed handover of site, owner – directed stoppages, delays by owner and owner-directed acceleration. The variable of ***life expectancy*** is a function of the ***quality*** variable.

#### 4.3.1.7) Association of the 'Contract Administration' group on *Reputation* of the parties to a project.

The ***reputation*** variable of the parties makes up with the other variable of ***future relations*** of the parties the business consequences group of variables. The data show that the 'contract administration' group of claims is associated with it. It ranked fifth out of eight variables. Government projects scored a weight of (2.57) while private ones scored a slightly higher score (2.74), an increase of 6.5% over government projects. It is evident that the more poor work done by any party to a project, the worse his reputation will be. Also bad treatment or poor administrative levels can make problems and can be associated with the

***reputation*** of any of the parties. Delayed payment by owner will surely affect his reputation, whether in the government or private sectors. Such a negative reputation will make contractors calculate that risk and add it to their bids. The result is that owners who have the reputation of paying late will have to pay for this in their future projects. If an owner causes delays to contractors, and asks for acceleration without compensating the contractor, his reputation is at risk. If he always has disputes with his contractors over extension of time, the price of extra work, give too many variation orders, and / or gives them untimely, his reputation will surely be affected. If a consultant is un-cooperative on a project or his contract documents are poorly prepared, his ***reputation*** is truly at risk.

#### 4.3.1.8) The association of the 'Contract Administration' group of claims on *Future Relations* between the parties to a project.

This variable is the second (with ***reputation***) of the business consequences group of variables. The data show that the 'Contract Administration' group of claims affects it. It ranked third after the ***time*** and ***money*** variables. Government projects scored a weight of (3.05) slightly less than private projects (3.13) the difference is around 2.5%. ***Future relations*** will be affected by the level of negative relations between the parties to a project. Delayed payment by owner and not granting the contractor the necessary extension of time due to owner delays will surely be associated with their ***future relations***. In addition, unresolved disputes over pricing and time needed for variation orders will have the some negative effect. The ***future relations*** between the owner and the consultant will also be affected if the consultant was un-cooperative during the project time, or if he produced poor contract documents. In the public sector projects, government officials are not very keen on keeping a good reputation or think of future relations, as the government is the largest owner in the industry, and they think contractors or consultants will come again anyhow for more work. The business-oriented approach is missing here.

**Discussion of the association of the 'Market Driven' group of claims on the eight variables (*Time, Money,...*).**

Generally, the association of this and the following three groups of claims is much less than the association of the previous two groups of claims. This group of claims contains such claim causes as these built on large inflation of construction cost, currency fluctuations, and shortage of basic resources or services.

## 4.4) The association of the 'Market Driven' group of claims on the Eight Variable

### 4.4.1) The Process Group

The data show low association with all the variables including ***time*** and ***money*** in comparison to the first two groups of claims, namely ('information and technical-based' claims, and 'contract administration claims')

#### 4.4.1.1) The *Time* and *Money* Variables

The association of ***time*** ranked the highest among the eight variables with government projects scoring (0.84) and public projects scoring a weight of (0.50). The large difference here (64%) is largely due to that this claim group consists of only three claim causes, and the associtions is not high, therefore the difference between government and private projects is insignificant. The inflation of costs claim might have an association with ***time*** if the contractor could not bear the financial consequences of that inflation and had to slow down or stop the work until his claim is settled. Inflation in Saudi Arabia is controlled and is only around 2% a year, so this claim is not of a strong association. At the start of the construction boom that took place between 1975 and 1985, prices soared from the early seventies prices, and so did the value of contracts, but

these who were caught with old contracts suffered the most. This claim cause of inflation of costs surely has an association with ***money***. The association is direct and directly proportional to the increase in inflation. The currency fluctuation claim cause might have an association with ***time*** if the contractor due to financial problems had to slow down or stop the work. Fortunately, the Saudi currency is fixed at a rate of 3.75 Riyals to the Dollar and there has been no currency fluctuation since the last devaluation of the national currency by 6.6% by the mid 1980s. Fluctuations occur in the exchange of the Riyal with the Japanese Yen, the same as the Yen fluctuates to the Dollar. Of course, there is a direct association of currency fluctuation with the ***money*** variable in a project and the association here is also directly proportionate to the intensity of fluctuation. Claims built on shortages in basic resources or services like work force, machinery, materials, fuel or transportation could surely be association with the ***time*** and ***money*** variables. If any of these services suffers from shortage, then the contractor might get late and overrun the completion date. It might also be association with the ***money*** factor if the contractor, in order to makeup for the shortages, would incur extra cost of importing or buying at the black market prices. This shortage happened only once in the early 1990s during and directly after the second Gulf War. The courts were overwhelmed with cases of this sort.

### 4.4.2) The association of the 'market driven' group of claims with the product group

#### 4.4.2.1) (*Operation, Quality, Function* and *Life Expectancy*) variables

The data show that in this product group of variables, ***operation*** was the highest association with government projects scoring (0.66) a little higher association than private projects (0.48). The inflation of costs claim might have an effect on ***operation*** of a project if due to this inflation the contractor had to resort to cutting corners, which might affect the future maintenance, and

***operation*** of the project. This same claim cause of inflation of costs might be association with ***quality*** as well in the same way if the contractor had to cut on his expenditure so as to make up for the anticipated loss due to inflation of costs in a project. ***Quality*** was affected as the second highest in this product group, with government projects scoring (0.5) a little higher than private projects (0.31). The ***function*** variable is the least associated and scored (0.37) in government projects and (0.24) in private projects. Function of a project could be associated with the inflation of costs in the same way quality will. If a contractor tries to make up for the inflation by affecting the quality or safety matters, especially in electro mechanical work, the function of a project could suffer. The ***life expectancy*** of a project is a variable of this product group of variables, and, together with ***function*** of a project, is the least affected by the 'market-driven' group of claims. It scored (0.37) in government projects and (0.27) in private projects. The ***life expectancy*** variable is a function of quality and it could by associated with by the inflation of costs claim if that claim is not settled justly. There could also be an impact by consultants on this group of variables (***operation, quality, function*** and ***life expectancy***) if for the same reason of making up for anticipated losses due to inflation of cost, a consultant tried to cut corners with either design drawings or site supervision. The risk on consultants is far smaller than that on contractors in this regard, because consultants will only suffer if the inflation of costs was in the manpower expenses, where as a contractor will also suffer if the inflation hit material, fuel, transportation and other prices. Currency fluctuation can have an association with this product group of variables in more or less the same manner as the previous cause of claim. If this claim is not settled, the contractor might look into cutting on his expenditure to avoid losing on this project. By doing so, he might affect the ***quality*** of work and might as well affect the ***operation*** of a project. The ***function*** of a project and ***life expectancy*** might in the same way be affected by the measures taken by a contractor to cut corners. The last claim cause in the 'market driven group of claims is that of shortage in resources or

services. The last time such a shortage was felt in the Saudi Construction industry was during the second Gulf War. This claim cause might have an association with ***operation*** and ***quality*** of a project if due to the shortage of resources, such as in materials, a project was completed with less quality materials than was specified. This might affect the future ***operation*** of a project as well as the ***quality*** of work in this project. The shortage in manpower or in machinery might have a similar effect on the variables. ***Function*** of a project and ***life expectancy*** might as well be affected in the same manner as ***operation*** and ***quality***.

### 4.4.3) The association of the 'market driven' group of claims with the Business Consequences group of variables

#### 4.4.3.1) *Reputation* and *Future Relations*

The data show that in this business consequences group of variables, there was a large weight of association with ***future relations***, which scored (0.81) for government projects while scoring much less in private projects (0.35). Inflation of costs claims, as well as currency fluctuation claims, might have their effect on future relations of the parties of a project, especially between contractors and owners. If owners neglect settling such inflation and fluctuation claims, as is the matter in public contracts, future relations will be affected. Public contracts have clauses that deprive contractors of any right in claiming any damages due to inflation of costs or fluctuation of currencies. The inflation rate in Saudi Arabia is very low (around 1.3% per annum in the last decade), yet when once the government owned petrochemical company rose prices of tar used in asphalting dramatically, all paving contractors asked for a correction of prices in their contracts. When they were denied that, most of them went to court asking for compensations. The court gave compensations to most of them. This must have been associated with ***future relations*** between public owners and contractors.

The effect of shortage of resources or services would have a minimal effect on future relations unless it delayed the handing over of a project, which might be associated with the future relations between the parties to a project. ***Reputation*** of the parties of a contract could be affected by market driven claims. If an owner, public or private, is known to neglect contractors' claims on inflation of costs or on currency fluctuations, this might have a negative effect on his reputation. The same applies if an owner was known to have a negative attitude to claims by contractors built on shortage of basic resources or services. The same might apply if a contractor was to be famous for over claiming on inflation, currency fluctuations or shortage of resources or services. In such an instance, the contractor's reputation will badly suffer.

## 4.5) Discussion of the association of the 'site conditions' group of claims with the eight variables (*Time, Money*, ....).

In general, the association of this group of claims with the variables is far less than the groups of 'information-based' and 'contract-administration' claims. The site conditions group of claims contains such claim causes as limited access to site, unpredictable sub-surface conditions, site containing historical ruins or a cemetery and disputed site ownership.

### 4.5.1) The association of 'site condition' group of claims with the process group ( *Time* and *Money* )

In discussing the association of 'site condition' claims with the process group of variables (***time*** and ***money***) we find that ***money*** scored (0.5) slightly more than ***time*** (0.43) in governmental projects while ***time*** scored (0.39) slightly more weight of association in private projects than in ***money*** (0.34). Limited access to the site will undoubtedly affect ***time***, and whether it was a partial or complete limited access to the site, it would be inevitable that the ***time*** variable will be affected. The weight of association will be proportionate to the limit of

accessibility to the site. It is quite logical that if there is a delay due to limited access to the site, there will also be an association with on the ***money*** factor as this delay will automatically be calculated in terms of expenses and damages. The unpredictable 'sub surface conditions' will have an be associated with ***time*** if the contractor had to partially or completely stop the work until these conditions were correctly dealt with. The association with ***time*** will depend on how quick the response of the owner and the consultant was, and whether the contractor will resume the work before or after his claim on this matter is settled. This claim will undoubtedly affect the ***money*** variable too. 'Subsurface condition' claims are no small claims, and a contractor, if seeing he will loose some money due to new or previously unknown subsurface conditions, will undoubtedly claim for compensation. The association with ***money*** will be related to the amount of new information and variation orders it will generate. The historical ruins or cemetery found on site will only be known after the contractor begins digging or earthmoving. Such a claim might take too long to settle. There are not many historical sites in Saudi Arabia, but there could be old cemeteries of unknown origin in several sites in and around cities and towns. The date of the cemetery should first be known in order to deal with the case. If the cemetery backdates fourteen centuries or less i.e. it is for Moslems then the cemetery can not be removed and the construction site must be changed to another location. If the cemetery were older than fourteen centuries, then it could be removed to another site and construction can be resumed. This process can take a long period to finalize. In one incidence, the contractor had to wait for one whole year for the government to decide, and finally it was decided to move construction to another site. The contractor claimed damages for fixed expenses for a total of a hundred million Saudi Riyals, which was almost 80% of, the cost of the project. Some effort must be made in pre construction soil investigations to clear up such matters and to minimize the occurrence of such claims. Therefore, it is evident here that if ***time*** is affected, ***money*** will be affected too. The same applies to claims built on sites where ownership is disputed. This is

not usual, but it might happen either in public or private projects. If two parties dispute over who owns the site, construction will have to stop for some time until things clear up. If things move to the court, this might take years to finalize. A contractor will undoubtedly claim for an extension of time and this time extension will be translated into a ***money*** claim too. The two variables ***time*** and ***money*** will suffer from the effect.

### 4.5.2) The association of 'site condition' claims with the product group of variables (*operation, quality, function* and *life expectancy*).

The ***operation*** variable was highly associated and similar to the association with ***time*** and scored a weight of (0.47) in government projects and only (0.3) in private projects. The other variables in this product group were much less associated. The ***quality*** variable was associated with a weight of (0.18) in government projects and (0.17) in private projects. The ***function*** variable scored (0.21) in government projects, while private projects scored (0.16). The ***life expectancy*** variable had a weight of association of (0.23) in public projects, while private projects scored (0.17). It is clear from the data that the effect on this product group of variables is minimal and there is little relation, if any, between the limited access to site and ***function*** or ***life expectancy*** of a project, unless a contractor was not granted a time extension due to limited site conditions, and he had to work quickly to avoid termination or going into penalties. At this point ***quality*** might suffer, and so will ***function*** and ***life expectancy*** of a project. The same applies to the other claims in this group, whether it is unpredictable subsurface conditions, cemetery or historical ruins found on site or disputed site ownership. The same effect will fall on the ***operation*** variable if the contractor was not granted the suitable time extension. The entire group of variables in this group might also suffer if due to any of the site condition claims a contractor suffered some damages and he was not granted

the fair compensation. If a contractor loses money due to any of these site condition claims, he will try to cut corners, and it is here that the ***quality*** variable will be affected and the other variables will in a chain reaction suffer too.

### 4.5.3) The association of 'site condition' claims with the business consequences group of variables (*reputation* and *future relations*).

The two variables in this group were not heavily affected. The ***reputation*** variable scored a weight of association of (0.23) in government projects and (0.21) in private projects. The ***future relations*** variable scored (0.26) in government projects and (0.19) in private projects. The 'site condition' claims can be associated with the reputation of owners if they were known for their stiff positions on granting any time extensions or compensations for damage arising from such claims. Government agencies are known for their denial of any extra cost to contractors for claims built on unpredictable subsurface conditions. It is clearly stated in public contracts that subsurface conditions are the responsibility of contractors, who should have made themselves familiar with the conditions on site through their own means. Such a position could negatively affect the reputation of governmental agencies. Some government ministries are known for their position on limited access to sites generally, and particularly in renovation and rehabilitation projects. Some government agencies had several problems with disputed ownership of sites, especially in ministries with heavy construction project plans like public health, education, and transportation. Private owners do not have much of these problems, as most of the public projects are in cities and towns and not in rural areas, yet still the ***reputation*** in private projects is affected. The ***future relations*** variable is affected when problems built on 'site condition' claims are not settled fairly, whether in respect of time extensions or damages. If matters aggravate and the claim goes to court, this might have a negative effect on ***future relations*** between the parties to a project. This could happen in government or private projects as well.

## 4.6) Discussion of the association of the 'man-made' group of claims with the eight variables (*Time, Money*, etc ...).

The association of this group of claims is far less than the groups of 'information-based' and the 'contract administration' groups of claims. The claim causes in this group contain such claim causes as war, strikes, fire, and pollution (either water-gas-radioactive...etc) which are all claims out of force majeure. Other claim causes are changes in legislation and impossibility of contract fulfilment.

### 4.6.1) The association of 'man-made' claims with the process group of variables (*time* and *money*).

In discussing the weight of association of 'man-made' claims with the process group of variables (***time*** and ***money***) we see from the data that these two variables were the most affected compared to the other six variables. The ***time*** variable had a weight of association of (0.21) for government projects and the same score (0.21) for private projects. The ***money*** factor scored (0.21) as well in government projects and slightly higher (0.24) in private projects. The claim on war will undoubtedly be associated with ***time*** if the contractor had to stop the work on the project, or even slow down the work due to any factor initiated by the war. ***Money*** will also be associated due to claims built on the issue of war, and the contractor might ask for damages or overhead costs due to the war. The same applies to the claim on strikes. If strikes were not due to the contractor's actions or omissions, and if they were not known to take place before the contract was awarded, then the contractor might claim an extension of time. There are no money claims for strikes and whatever the contractor loses in strikes, he can cover by insurance, and if not, he will bear the financial risk himself. Strikes are illegal in Saudi Arabia and there are no insurance policies against strikes offered locally. Insurance policies against war were very rare prior to the second gulf war, but since then (1991) it became more popular. The

claims on pollution might affect the ***time*** variable, but these are rare and, if claimed, they will only affect the ***time*** variable and not the ***money*** variable, because money will be compensated through an insurance company or by the contractor himself if he fails to get a proper coverage for that claim cause. The change in legislation claim cause might affect the ***time*** variable or might affect the ***money*** variable, depending on the new legislation and its impact on either variable. Some contracts used in Saudi Arabia have clauses that prevent the contractor from claiming any extension of time or money if a new legislation was passed that was to affect him. Some more rational contracts have provisions that state the right of the contractor to claim extra money if the customs he had to pay to execute the contract were raised by any percentage. They also stated that if customs paid were less than anticipated due to new legislation, he would give back the balance to the owner. Public contracts do not elaborate on such a point. The impossibility of contract fulfilment cause of claim depends on new legislation that makes constructing the project illegal or banning the construction on a particular site due to new previously unknown factors. Due to new enlargement projects for the two holy mosques in Makkah and Madinah, some construction projects that were already going on near the mosques, when the plan was announced, had to stop and were demolished for the sake of expanding the two holy mosques. The government compensated owners, but some contractors went into long disputes with owners for the settlement of their claims. This kind of claim cause will only be associated with the ***money*** variable, as ***time*** is not affected here and only money claims will be entertained.

### 4.6.2) The association of 'man-made' claims with the product group of claims (*operation quality, function* and *life expectancy*).

The ***operation*** variable had a moderate weight of association in comparison to the time and money variables. It scored (0.13) in government projects and (0.18) in private projects. The ***quality*** variable scored (0.08) in government and (0.13) in private projects. The ***function*** variable scored the least

in government projects (0.05) and scored (0.16) in private projects. The ***life expectancy*** variable was associated by a weight of (0.08) in government projects and (0.1) in private projects. It is clear from the data that the effect of the 'man-made' group of claims is minimal on the product group of variables. War and strikes claims might have no effect on **operation** or **quality** of a project unless these two claim causes caused a shortage of manpower that forced the contractor to resort to less skilled labour, or to use less-than-specified material. In such a case, ***future operation*** of a project or the ***quality*** of a project could suffer. The same applies to the association with ***function*** and ***life expectancy*** of a project. The ***function*** variable was impacted three times higher in private projects than in government projects. This might be due to that these 'man-made' claims are better dealt with in government projects than in private ones, resulting in less association of these claims with government projects. The claim causes on fire and pollution have little weight of association with ***operation*** of a project, but might have an association with ***quality*** if the effect of fire or pollution was not technically and professionally dealt with. The ***function*** of a project might not suffer but the ***life expectancy*** might be affected by the fire claim cause for the same reason. The change in legislation cause of claim might have no association with the four variables in this product group of variables, unless the contractor had to cut corners to compensate his loss caused by the new legislation, and in such a case ***quality*** will surely suffer and the ***life expectancy*** might as well suffer. The claim cause of impossibility of contract fulfilment might not be associated with any of the four variables in the process group of variables, because the project, due to this claim, will not be completed and in some cases will be demolished, as stated above. Other projects can just be abandoned leaving the effect on the other variables, but not these four in particular.

### 4.6.3) The association of 'man-made' claims with the business consequences group of claims (*reputation* and *future relations*).

The association of this group of variables is moderate in comparison to the process group (***time*** and ***money*** variables). The association with the ***reputation*** variable was a weight of (0.08) in government projects and (0.1) in private projects. The ***future relations*** variable scored (0.16) in government projects and (0.11) in private projects. The war cause of claim might have an association with the ***reputation*** of owners who do not settle these claims fairly. The ***reputation*** of contractors who have over claimed based on war might as well be associated. The difference in weight of association with government and private projects was not great. The same applies for claims on strikes, fire and pollution. Claims on pollution are rather rare in the Saudi construction industry due to that the country is still a developing one. ***Future relations*** might get affected if an owner (public or private) does not fairly settle these claims on war, strikes, fire or pollution. The same applies if a contractor seizes the chance of such an incident to claim larger than logic amounts. The change in legislation claim might have an association with on owners' reputation if they include clauses in their contracts banning contractors from claiming any damage based on change of legislation. Such owners will undoubtedly gain negative reputations. This will have its association with ***future relation***s too. The impossibility of contract fulfilment claim cause is relatively rare, but nonetheless will be associated with owner's reputation in public as well as private projects if this claim is not dealt with professionally. If claims of this sort are not settled on time and to a fair result, ***future relations*** between the parties will surely suffer.

### 4.7) Discussion of the association of the 'Acts of God' group of claims with the eight variables (*Time, money*, etc ... ).

The association with on this group of claims is not high compared to the that with the 'information-based' and 'contract-administration' groups of claims. The claim causes in this group contain such claims as severe weather conditions, floods, typhoons and earthquakes.

### 4.7.1) The association with of 'Acts of God' claims on the process group of variables (*time* and *money*).

The data show that the ***time*** variable is the most associated with a weight of (0.24) for government projects and only scoring (0.06) for private projects. The ***money*** variable was the second highest out of the eight variables scoring (0.16) for government and (0.18) for private projects. It is very rare in Saudi Arabia that there happen unforeseen weather conditions. The weather might be very hot and humid in certain parts of the country, but that is not unusual, and the average contractor will know that certain days in summer will be very hot so he will take that in consideration in his time schedule, or resort to night shifts. The weather is also cool to cold in winter in some areas and it is not unusual that it snows for some days in these areas. Rain is not unusual on the mountains and it rains sometimes 180 days in some mountain areas. Floods may happen in valleys were it rains on the mountains. Typhoons are rare and earthquakes are common only in known areas in the country, especially in the northwest. Due to the above information, Acts of God claims are not common in Saudi Arabia, but could happen as weather conditions change due to the global warming effect. The ***time*** factor will be surely affected by 'Acts of God' claims, whether they are severe weather conditions, floods, typhoons, or earthquakes. The government projects scored almost four times as much as private projects on the association with time. This might suggest that the government does not deal professionally with this kind of claim and does not grant any extension of time, or the fair amount of ***time***, to contractors due to these claims. The ***money*** variable might be associated as well with 'Acts of God' claims, but it is the usual practice that contractors buy insurance policies to cover these unpredictable factors. The owner, whether public or private, will be reluctant to compensate the contractor with any some of money for a claim for which he (the owner) is not to blame.

### 4.7.2) The association of of 'Acts of God' claims with the product group of variables (*operation, quality, function* and *life expectancy*)

The data show that the product group of variables is almost average in the association with its four variables by the 'Acts of God' claims. In all four variables, the private projects scored more than in government projects. This might suggest that the association with ***operation, quality, function*** and ***life expectancy*** of a project is more felt in private projects than in public ones, although it was shown previously that the association of these claims with the ***time*** variable was much less in private projects than in public ones. The association with the ***operation*** variable was (0.1) in government projects and was (0.14) in private ones. ***Quality*** was associated with a weight of (0.08) in public projects while private projects scored (0.18). The ***function*** variable scored (0.1) in government projects and (0.13) in private projects. The ***life expectancy*** variable was associated with a weight of (0.1) in government projects and (0.16) in private ones. The severe weather condition claim might affect the ***operation*** and ***quality*** of a project if the material used in this project was not designed to withstand such harsh or unexpected weather conditions. It is the same with floods, but typhoons will rarely be associated with the ***quality*** or ***operation*** of a project. Earthquakes too might not be associated with the ***quality*** or operation of a project. The severe weather conditions, floods, typhoons or earthquakes might not usually be associatde with the ***function*** variable of a project, but these previous factors might have their association with the ***life expectancy*** of a project if construction was negatively affected by any of them.

### 4.7.3) The association of 'Acts of God' claims with the business consequences group of variables (*reputation* and *future relations*)

The data show that this business consequences group of variables was moderately associated with acts of god claims. The private projects scored higher than public projects in the ***reputation*** variable [public scored (0.08)) and

private scored (0.13)]. In the ***future relations*** variable, public and private projects scored almost the same association weight [public scored (0.13)) and private scored (0.14)]. The 'Acts of God' claim group could be associated with the ***reputation*** of owners depending on how they usually deal with such kinds of claims, and ***future relations*** between the parties could suffer if these claims were not dealt with professionally.

## 4.8) General overview

### 4.8.1) Discussion of the total association of the six groups of claims ('information', 'contract administration', ...) with the eight variables (*time, money*,...) concerning ownership (government and private)

It was seen from the data that the 'information based' claim group of claims had the heaviest association weight with the eight variables. Government projects scored (46.96), slightly higher than private projects (44.72). The 'information and technical based' group of claims revolved around poor technical and managerial skills of the contract privates, disputes on variation orders, delay in approvals or submittals, poor submittals, problems with design specification, or quantities. The results show that there is a real problem here and that construction professionals should give enough attention to upgrading their skills in the abovementioned areas. It is also crucial to up grade the skills of contractors and owners in order to minimize claims arising out of information and technical matters. There are no trade unions in Saudi Arabia, but contractors are members of the contractors' committee in each of the major chambers of commerce. These take the responsibility of a minor trade union, but are still far from accomplishing the job of continues up grading of their members. Consultants too are members of the engineers' committee in major chambers of commerce. They too are members of the Engineering committee, which acts as a professional society. It is taking part in upgrading the consultants' skills and capabilities through offering short courses and through some publications. Public owners are the responsibility of the government and it has some short

courses which its employees have to pass before getting a promotion. It seems some of these courses need to concentrate on how to avoid or minimize claims in construction projects. The 'contract administration' group of claims ranked second after the 'information based' claim group. Government projects scored (22.11), a little less than private projects, which scored (23.46). This group of claims revolved around delayed payments, disputes on reimbursements due to delays or variation orders, poorly prepared contract documents, poor documentation and nominated sub contractors. It is clear here too that there is some need for upgrading the contract administration capabilities of all parties to a project. The remaining four groups of claims all scored far smaller weight of association in comparison to the first two ('information' and 'contract administration'). The following table shows the association with the six groups of claims.

| Rank | Claim Group | Association with Government projects | Association with Private projects |
|---|---|---|---|
| 1 | Information and technical | 46.96 | 44.72 |
| 2 | Contract Administration | 22.11 | 23.46 |
| 3 | Market Driven | 5.04 | 3.0 |
| 4 | Site Conditions | 2.56 | 1.94 |
| 5 | Man Made | 1.72 | 1.22 |
| 6 | Acts of God | 1.0 | 1.013 |
| **Total** | | **79.39** | **75.47** |

**Table(4-1) Association of the six groups of claims on all the eight variables (grouped) concerning ownership (government, private)**

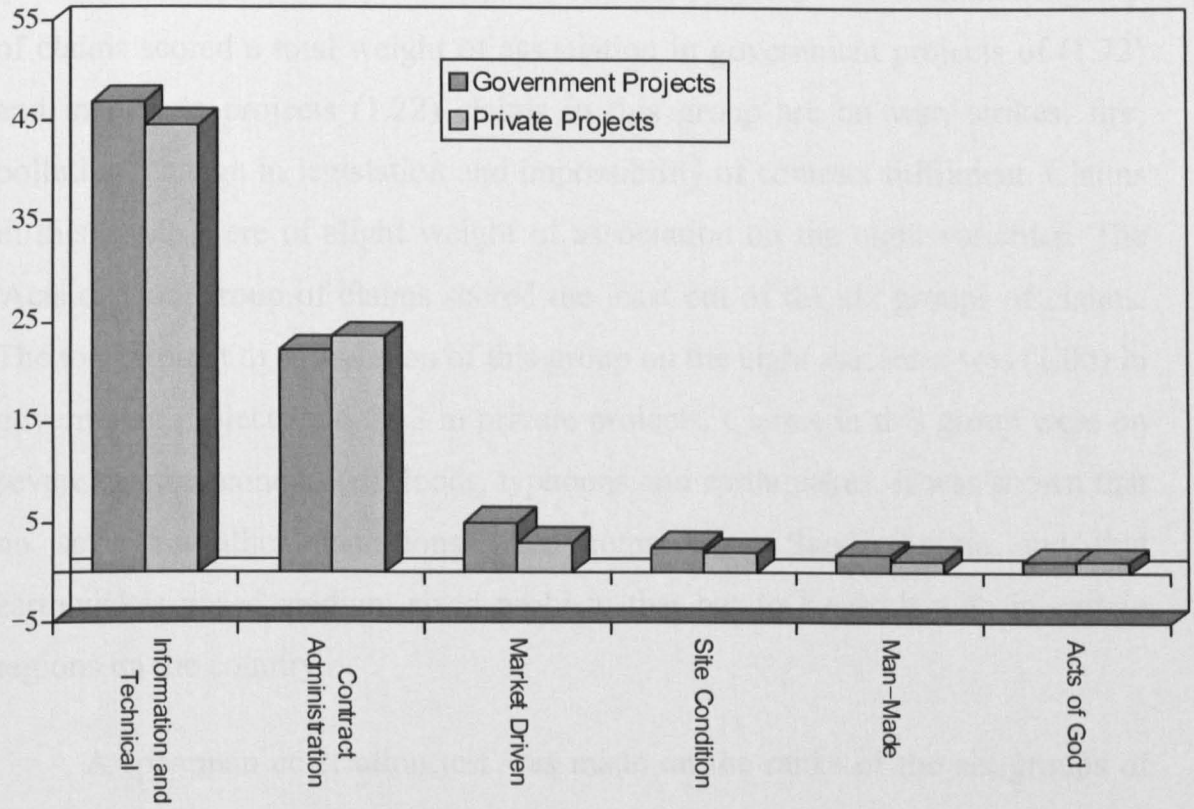


**Fig (4-1) association of the six groups of claims with all the eight variables ( grouped ) concerning ownership (government, private)**

The 'market driven' group of claims scored a total weight of association on the eight variables of (5.04) on government projects and (3.0) in private projects. The claims in this group were on inflation, currency fluctuation and shortage of basic materials or services. It was shown that inflation in Saudi Arabia was under control and fluctuations of currencies were not of a great effect. Shortage of basic materials or services happened once during the second gulf ware in 1991, but ended shortly after. The 'site conditions' group of claims scored a total weight of association on the eight variables of (2.56) in government projects and (1.94) in private projects. The claims in this group were on limited site access, subsurface conditions, historical or cemetery ruins on site and disputed land ownership. It was shown that subsurface conditions are an issue that has to be properly addressed especially in government projects. Cemetery ruins would create great disruptions to project schedules. The disputed on land ownership is

no big problem, especially in the private sector projects. The 'man-made' group of claims scored a total weight of association in government projects of (1.72) and in private projects (1.22) claims in this group are on war, strikes, fire, pollution, change in legislation and impossibility of contract fulfilment. Claims in this group were of slight weight of association on the eight variables. The 'Acts of God' group of claims scored the least out of the six groups of claims. The total weight of association of this group on the eight variables was (1.00) in government projects and 1.13 in private projects. Claims in this group were on severe weather conditions, floods, typhoons and earthquakes. It was shown that no severe weather conditions were common in Saudi Arabia and that earthquakes posed medium sized problem that has to be dealt with in certain regions on the country.

A spearman correlation test was made on the ranks of the six groups of claims in relation to government and private ownership and the results show that government and private projects look to the six groups of claims in the same way and that the six groups have an association with them in the same order. The total weight of association of the six groups of claims on government projects was (79.38) compared to (75.47) in private projects. The difference is only 5%, which is not significant, and it can be said that government and private projects are almost equally associated with the six groups of claims.

### 4.8.2) Discussion of the total weight of association with the eight variables (*time, money*, etc ...) by the six groups of claims.

The following table shows the total weight of association with each of the eight variables by the six groups of claims (information, contract administration ... etc)

| | Variable | Rank | weight of association with (governmen t) | Rank | weight of association with Private |
|---|---|---|---|---|---|
| **Process** | ***Time*** | 1 | 14.57 | 1 | 13.00 |
| | ***Money*** | 2 | 13.86 | 2 | 12.08 |
| **Product** | ***Operation*** | 3 | 10.52 | 3 | 10.11 |
| | ***Quality*** | 6 | 8.37 | 6 | 8.34 |
| | ***Function*** | 8 | 5.89 | 8 | 7.15 |
| | ***Life expectancy*** | 7 | 6.10 | 7 | 6.42 |
| **Business Consequenc es** | ***Reputation*** | 5 | 9.65 | 5 | 9.03 |
| | ***Future Relations*** | 4 | 10.43 | 4 | 9.34 |
| | Total | | 79.38 | | 75.47 |

**Table(4-2) Total weight of association with the eight variables by the six claim groups regarding ownership.**

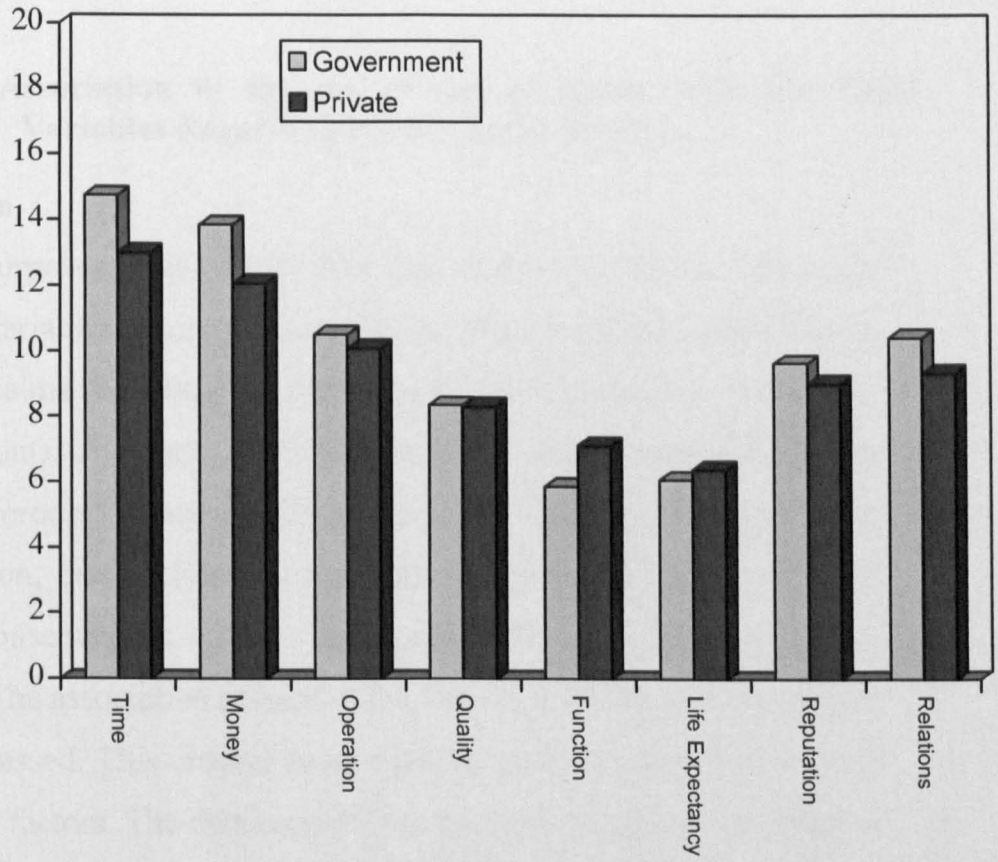


**Fig (4-2) Total weight of association with the eight variables by the six claim groups regarding ownership**

It is obvious from the previous table that the ranking of both government and private projects is the same for the associated variables. This shows that there is no significant difference in how public or private owners see the association with the eight variables in their projects. It is also evident from the table that ***time*** was the highest association with variable followed by ***money***. Then came ***operation*** of projects, ***future relations*** between the parties to a project, ***reputation*** of the parties, ***quality*** of work, ***life expectancy*** of a project and last the ***function*** of project. This shows the importance of the ***time*** factor in both public and private projects, and shows that ***money*** is still an important factor, coming second after the ***time*** factor. In today's culture, time will also be calculated in terms of money, making money the main concern of the construction parties.

## Chapter 5

### Association of the six groups of claims with the Eight Variables Regarding Parties to the Project

### Introduction

The purpose of this chapter is to discuss the association of the eight dependent variables, coming out of the literature review, by the different groups of claims regarding the parties to the project (owner, contractor, and consultant). The eight dependent variables were grouped into three groups: the process group (the time and money variables) product group (the operation, quality function and life expectancy variables) and the business consequences group (the reputation and future relations variables). The association of each of the variables and each of the groups will be discussed. This chapter is speculating on the causal relationships between the factors. The data comes from the analysis of the responses of the questionnaire and the associations shown in this chapter are calculated as the normalized weights from the collected data.

### 5) The weight of associations regarding parties to a project.

The following is a discussion of the weight of associations by the six groups of claims on the eight variables (time, money...etc) regarding the parties to a project (owners, contractors and consultants). The six groups of claims under which all claim causes in the questionnaire were grouped, were as follows:

- Information and technical-based claims.
- Contract administration-based claims.
- Market-driven claims.
- Site condition claims.
- Man-made (force majeure) claims.
- Acts of god claims.

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- Acts of god claims.

The following is a discussion on each group independently:

## 5.1) Information and technical-based claims:

### 5.1.1) The Process Group (Time and Money)

The data show that the weight of association with the ***time*** variable is the largest among the eight variables. This group of claims contains claim causes such as poor workmanship, poor technical skills by any party to the project, disputes over variation order (timing and cost), delay in approvals (drawings, schedules, material, work done and tests) it also includes claims on mistakes in specification, delay in submittals (by any party), poor submittals, poor design, detailed or shop drawings. It is evident from the data that there is a great association with the ***time*** variable by those claims grouped in the information and technical-based claim causes. The weight of association is highest on consultants, scoring a weight of association of 9.19. Owners came second scoring weight of association weight of 7.48 and contractors followed by an association of 6.51. The ***money*** variable came in second place after the ***time*** factor. Consultants scored the largest of weight of association equal to (7.95), while owners and contractors had almost the same weight of association, scoring (7.04) and (7.03) respectively. The ***time*** and ***money*** factors make together the process in a project. In discussing the weight of association on the product group of variables, we find that the ***reputation*** variable was the highest associated in this group followed by ***quality***, ***life expectancy*** and ***function*** of a project respectively. The association with ***operation*** was (7.3) in consultants, (5.6) in owners and (4.38) in contractors. The association with the ***quality*** variables follows scoring (6.78) for consultants, (5.04) for owners and (3.0) for contractors. The association with ***life expectancy*** and ***function*** of a project are almost identical. ***Life expectancy*** scored (5.1) for consultants, (2.96) for owners,

and (2.55) for contractors. The ***function*** variable scored (5.1) for consultants, (2.96) for owners and (2.31) for contractors. The last group of variables is the business consequences group which is formed of ***reputation*** of the parties to a project and ***future relations*** between these parties. The ***reputation*** factor scored a little higher than the ***future relations*** factor. Owners in the ***reputation*** factor scored a weight of association of (6.8) while owners scored (5.24) and contractors scored (4.55). The ***future relations*** variable scored (6.65) in consultants, (4.8) in owners, and (5.13) in contractors. It is evident from the data that the consultants always had the largest weight of association with all the parties and in all the variables. They were followed, almost always, by owners and then by contractors. It might be due to that consultants are independent of the other two parties and have no large stakes at risk in the project, that they might give a balanced impression of the association with the claim groups on the eight variables. It might also be that because consultants are usually better educated than the other two parties, that they might feel the weight of association in its real strength. Private owners and contractors do not have to be qualified so as to get a license to work, so some of them with medium or less education can be indifferent to risks in them true magnitude. Public owners, though, are well educated and qualified, but will always give the point of view of an owner, which is different from the other two parties view. Owners came second after consultants and this might be due to that almost all of the claims in this information and technical-based claim group have to do with actions of the consultant or contractor, and owners are not much involved in such actions. Yet still the group of owners feel the weight of association with the eight variables more than contractors do. Contractors came in third place and this might be due to that most claims in this information and technical-based claim group have to do with actions or omissions of

contractors, so this contractor group does not see that their association is so high on the eight variables. The matter could be due to the standard of education of this group. The only time this group of contractors scored higher than the owner group was in the association with ***future relations*** between the parties to a contract. It is obvious that contractors put a weight on this variable and share the same concern with the other two groups (consultants and owners) in feeling the weight of association the information-based claims have with the ***future relations*** variable. In discussing in some detail the claim in the information and technical group of claims we find that construction defects and poor workmanship are common claims in this category. Consultants, being the first to be affected by these claims, will no doubt feel the strength of such claims more than contractors will do. Some contractors even do not think that there is defective work executed by them or that, if there is, it will have a large association with ***time*** or ***money***. Other claims in this group are around poor technical skills by any of the three parties to a project, poor management by the contractor and disputes over the process of variation orders. The weight of association felt by consultants, being the professionals, is higher due to these claims. They are more cautious on matters of quality and good management than their counter parts in the project. Owners too feel the weight of association with the ***time*** variable and 13% less on the ***money*** variable. Contractors feel less weight of association with ***time*** than owners by 15% and 41% less weight of association than consultants. On matters relating to them, contractors do not see their weight of association as high as the others see it. Contractors and owners feel almost the same weight of association with information based claims on the ***money*** variable and are both less by 13% than consultants. Other information based claims in this group are around delay by consultants in approval of drawings, schedules and material, or

poorly prepared specifications. These claims will undoubtedly have an weight of association ***time*** and ***money***, and consultants are to blame for these claim causes. The most affected by these claims will be contractors, because they are the ones that have to finish on schedule or face delay penalties. Owners too will be affected, as their project will not be handed over on time, with all the consequences they might bear for that in terms of money and time. Although these claims are the fault of consultants, yet they felt the largest weight of association with the ***time*** and ***money*** variable in the information based claim group as a whole. Other claims in this group are delays in submittal of drawings by any of the three parties, poor submittals of shop drawings by the contractor, as built drawings or schedules. There is some sharing of responsibility of delayed submittals of drawings by any of the parties. Poor submittals of drawings or schedules by the contractors are their responsibility. Both claims will have an association with the ***time*** and ***money*** factors. Contractors think that the effect of weight of association is larger on the ***money*** variable than on the ***time*** variable. Consultants and owners do not share that view with them. It seems contractors tend to calculate the ***time*** factor more on the basis of how much it costs them more than does the other two parties. The last group of claims in this 'information based' group of claims is on poorly 'prepared design drawings' (either incomplete, contradicting or full of errors). These claims will surely have an association with the ***time*** factor and might as well have an association with the ***money*** factor. This claim is due to poor technical skills by consultants or might be due to that the project was not given enough time for the design phase. Still consultants feel the weight of association as the highest of the three parties. They feel the weight of association with ***time*** more by almost 16% than that on money. Contractors feel the weight of association with

***money*** more by 8% than that on ***time*** and owners feel the weight of association with ***time*** more than that on ***money*** by 6%.

### 5.1.2) The Product Group:

The variables of ***time*** and ***money*** (discussed above) make up the process group of variables. In discussing the product group of variables (***operation, quality, function*** and ***life expectancy***) and the association with them by the information group of claims, we find the same pattern of consultants scoring the highest weight of association, followed by owners and then contractors. The highest association was with the ***operation*** variable with consultants scoring weight of association of (1.3) followed by owners who scored (5.6) and the contractors who scored (4.38). The next associated variable was ***quality*** with consultants scoring a weight of association of (6.78), followed by owners who scored (5.04), then contractors who scored a weight of association of (3.0). The third variable in this product group of variables is the ***function*** of a project with consultants scoring a weight of association of (5.09), owners (2.96) and contractors scoring (2.31). The last of the variables in this product group is the ***life expectancy*** variable, where consultants scored (5.1) and owners (2.96), while contractors scored (2.55). The same pattern of consultants scoring the highest weight of association, followed by owners and then contractors is evident here. In the ***operation*** variable, consultants scored 30% more than owners and 66% more than contractors. In the ***quality*** variable consultants scored 35% more than owners and 25% more than contractors. In the ***function*** variable consultants scored 72% more than owners and 120% more than contractors. In the ***life expectancy*** variable, consultants scored 72% more than owners and scored 200% more than contractors did. The claims in this group contain some which concern construction defects and poor workmanship by the contractor. These

claims will surely have an association with the ***operation*** and ***quality*** of the project if their effect was not rectified during the course of construction. The ***function*** and ***life expectancy*** of a project might also be associated. Consultants still feel more the weight of association by these claims on the four variables of this product group, followed by owners and contractors. Poor workmanship by the contractors could be due to several reasons. One is awarding a contract to the lowest bidder, a practice popular in public projects and in small residential or commercial private projects. These unqualified contractors are not pre qualified before being awarded the jobs. Another reason is that newcomers to the construction industry are a major source of poor workmanship. New entrants to the industry are attracted by the anticipated profits from the construction industry; they frequently enter the market with little knowledge of pricing techniques or any technical back-ground. The results are frequently dramatic and the courts are crowded with these newcomers' problems. The construction industry attracted thousands during the boom in the mid seventies, but many of these withdrew from the market when things settled down after the boom. The results of work done by the low quality contractors were dramatic. A report issued by the Ministry of Housing and Public Works showed that more than 70% of all public buildings built in Saudi Arabia during the construction boom period of 1975-1982 will only have a life expectancy of fifteen years (compared to seventy years nominal life expectancy of concrete buildings). Another of the reasons for poor workmanship is the absence of real technical supervision, which was discussed earlier. People of little or no education at all might look to fees paid to consultants as wasted expenses. If they choose to go to a consultant for supervising the construction of their homes, which is optional in small housing projects, they will try to pay the least they can, not having an idea of the effect of

good supervision on the outcome of the project. Poor workmanship has led to homes and other buildings losing a lot of their resale value. Repair work, especially in concrete or plumbing work, has cost home owners a lot to keep their buildings fit for living. The lesson was learned by the affected people, but there are always new owners that will join the learning circle everyday. The public sector has to qualify contractors for medium sized jobs (over 5 million Saudi Riyals), but still a lot of small size public projects suffer from low quality and poor workmanship. Other claims in the information and technical based group of claims revolve around poor technical skills by any party (consultant, owner or contractor) and poor management by contractor. Poor technical skills might have an association with the future ***operation*** of a project and might as well have an association with the ***quality*** factor. The ***function*** and ***life expectancy*** of a project might also have an association with such a claim cause of poor technical skills. The claim on poor management by contractor will not have any association with the ***operation, quality, function*** and ***life expectancy*** of a project unless there is an impact on technical issues due to the poor management of the contractor. Good management is a must for a contractor if he wants to profit and survive in the market, especially during recession periods and periods of high competition. Small and medium sized contractors do not pay much attention to management issues, and put all their weight behind financial and technical issues. There is some room here for contractors' committees in major chambers of commerce to emphasise such points and give ample training to their members. Other causes of claims in the information based claim group are the dispute over variation order pricing, delay in approvals (drawings, material, scheduling, and work) and poorly prepared specifications. The dispute over variation order pricing might not have an association with the four variables in the product group of variables. This

claim has to get more attention from all the project parties to minimize the claims arising out of it. The claims on delay in approvals might not have an association with the ***operation, quality, function*** or ***life expectancy*** of a project as well. The claim on poorly prepared specifications might have an association with the previous four variables. Poorly prepared specifications can have an association with ***quality*** and might be associated as well with the future ***operation*** of a project and its ***life expectancy***. ***Function*** might be slightly association with such a claim cause. The dispute over variation orders could be due to any or all of the parties to a project. Delay in approvals is mainly due to the consultants' actions or omissions. Poorly prepared specifications are due to consultants as well. Although consultants know that they are behind such causes of claims, yet they still feel the association with the four variables of the product group, more than do either owners or consultants. Probably that the code of for consultant has helped them pinpoint their weaknesses and claim responsibility for it. The last cause of claim in the information based group of claims is on poorly prepared design drawings. These could affect the ***quality*** of project and might as well affect the ***operation***, ***function*** and ***life expectancy***. This cause of claim is directly attributable to consultants. It has been earlier discussed that there are very little follow up of work performed by consultants and there is no professional body that controls or oversees the performance of consultants. The Engineering Committee is trying to cover some of this scope, but being part of the Ministry of Commerce and not a part of a technical based government body makes it not the best of governing bodies to oversee the profession. It has been shown from the previous discussion that most of the claim causes in this information group of claims is either due to contractors' or consultants' poor performance, yet consultants feel the greater weight of association of these claims with the variables of a project, followed by

owners (who are not to blame for most of the claim causes) and followed by contractors who are to blame for half of the claim causes). The contractors' view is that there is an association with the variables due to these claim causes, but this weight of association is felt less by contractors than by the other two parties.

### 5.1.3) The Business Consequences Group (Reputation and Future Relations)

The last group of variables is the business consequences group which contains the two variables ***reputation*** of the parties and ***future relations***. Consultants scored (6.8) a weight of association with ***reputation***, while owners scored a weight of association of (5.24) and contractors scored (4.55). Here consultants scored 30% more than owners and almost 50% more than contractors. Consultants scored (6.65) as a weight of association with ***future relations*** while owners scored (4.8) and contractors scored (5.13). Consultants scored about 39% more than owners and 30% more than contractors. This was the only time in this information group of claims that contractors scored more than owners. Probably public owners are not very keen on their ***future relations*** with the parties, as there is no financial motivator here. On the contrary, contractors driven by the need for more work in the future could feel the a weight of association of this claim cause more than public owners do. To some private owners ***future relations*** are not important as they might not get into more future projects after finishing constructing their homes. The claim causes built on construction defects and poor workmanship undoubtedly have an association with the ***reputation*** and ***future relationship*** of the project parties. It seems that contractors are keener on ***future relations*** than on ***reputation***. Poor management by contractor

could affect both variables in this business consequences group of variables. Disputes over pricing of variation orders could affect the ***reputation*** of the party known to be tough on such matters, like owners, or over claiming for this cause, like contractors. This dispute might affect the ***future relations*** of the parties. The claim on the delay in approvals or poorly prepared specifications undoubtedly will affect the ***reputation*** of the consultant and might have an association with his ***future relations*** with the owner. Claim causes on delayed submittals of drawings or poor submittals by contractor might have the same negative effect on the two variables. The claim on poorly prepared design drawings will surely affect the ***reputation*** of the consultant and strain his ***future relations*** with the owner. The previous pages were a discussion of the weight of association of 'information and technical-based' claims on the eight variables, which were grouped in three groups: process, product and business consequences to a project. It has been shown that the process group (***time*** and ***money***) was the highest associated, followed by the business consequences group of variables (***reputation*** and ***future relations***). The least affected group was the product group (***operation, quality, function*** and ***life expectancy***). The highest association was felt by the consultants followed by owners and then contractors. The difference in weight of association felt by consultants was sometimes over 100% more than that felt by contractors. The highest weight of association felt by consultants was on the ***time*** factor and the least was on ***function***. The weight of association with ***time*** was 80% more than that on ***function***. The same pattern is seen with owners and contractors. The weight of association with ***time*** for owners was 150% more than that on ***function***, and for contractors the weight of association with ***time*** was 180% more than the association with ***function***.

### 5.2) Contract administration-based claims

This group of claims comes in second place after the information and technical based claim group. The contract administration group of claim causes contain such claims as poor coordination between contractors, delayed payment by owner, delayed handover of site to contractor, stoppage of work by owner, disputes over owner-caused delays, directed acceleration, time extension and variation order pricing. It also includes claims on timing and delay in payment of variation orders; too many of them, consultant not cooperative and, contract clauses on dispute resolution are missing from contract. It also contains claims on poorly prepared contract documents (either ambiguous contradicting or incomplete), and finally disputes over nominated sub contractors. It is evident from the data that there is a great association with the ***time*** variable by those claims grouped in the contract administration based group of claim causes. The association with ***time*** is greatest on contractors who scored a weight of association of (5.27) which is 30% more than that scored by consultants (4.04) who came in second place, and almost 42% more than owners who came in third place. The ***money*** variable came in second place after the ***time*** variable. Contractors also scored the highest weight of association equal to (4.9) which was 25% more than that of owners, who came in second place and scored (3.92) and 32% more than consultants who scored (3.7) and came in third place. The '***time***' and ***money*** variables make together the process group in a project. In discussing the weight of association with the product group of variables, which is made up of the four variables ***operation***, ***quality***, ***function*** and ***life expectancy***, we find that the greatest weight of association was felt on the ***operation*** variable. Contractors too felt the weight of association slightly more than the other too parties.

They scored a weight of association equal to (3.37) which is only 6% higher than what consultants scored (3.17) and 12% more than the score by owners, who scored a weight of (3). The three other variables in this product group are almost equally associated. The ***quality*** variable has consultants feeling the greatest weight of association, where they scored a weight of (2.71). This is 47% more than the weight of association with owners, who came in second place, and 75% more than what contractors scored (1.5) and came in third place. The ***function*** and ***life expectancy*** variables had consultants in first place and slightly over the other two parties. In the ***life expectancy*** variable, the consultants scored (2.08) which is 23% more than both contractors and owners who scored (1.69) and (1.68) respectively. In the ***function*** variable, consultants scored (1.98) which is 15% more than what contractors scored (1.72) and 55% more than owners (1.28).

### 5.2.3) The Business Consequences Group (Time and money)

The last group of variables is the business consequences group which is made up of the two variables ***reputation*** and ***future relations***. The weight of association with contractors of ***future relations*** was high and scored a weight of association equal to (4.31) which is 49% more than the weight of association with consultants, who scored (2.9) and 77% more than owners, who scored (2.44). The impact on ***reputation*** was also more felt by contractors than by the other two parties. Contractors scored a weight of (3.34) which is 24% more than what consultants scored (2.7) and 28% more than what owners scored (2.6).

### 5.2.4) The Parties to the Project:

It is evident from the data that contractors scored the highest weight of association in five out of the eight variables and consultants

scored the highest weight of association in the three remaining variables. Owners were in third place in six out of the eight variables, and second in two others. It seems that because most of the claims in this contract administration group of claims are caused by owner's actions or omissions that contractors feel the most weight of association, followed by consultants and then owners in third place. The total weight of association with felt by contractors on the eight variables is equal to (26.17) which is 12% more than the total weight of association felt by consultants and 28% more than the total weight of association felt by owners. Consultants came in second place probably because they are independent of the other two parties and because most of the claim causes in this contract administration group of claims are caused by owners. This gives the result of weight of association with consultants as a balanced impression and an average between the other two parties. They scored the highest in the ***quality*** variable, which is a great concern to consultants, and they were slightly higher in the ***function*** and ***life expectancy*** variables. Owners came in third place with far less weight of association compared to contractors in four out of the eight variables. They scored slightly less than consultants in most of the variables save for ***quality***. Probably it is because most of the claims in this contract administration group of claims are caused by the owners, that they see it of a less weight of association than do contractors, who are affected by these claim causes, or by consultants, who are nominally neutral but also affected by some of the owners' actions and omissions.

### 5.2.4.1) The Process Group of Variables:

In discussing in some detail the claim causes in the contract administration group of claims on the process group of variables (***time*** and ***money***) we find that poor coordination between contractors will no

doubt affect the ***time*** variable. Poor coordination between contractors might be the owner's responsibility or that of the consultant. In any case the weight of association with the ***time*** variable will be felt by the contractor. Claims caused by delayed payments from the owner will no doubt affect the ***time*** and ***money*** variables. This will be felt by contractors to a greater extent than by the other two parties. The claim causes of delay in handover of site to the contractor and work stoppage by owner are both caused by the owner of a project and will no doubt have an association with the ***time*** variable. It will no doubt have its association with the ***money*** variable as well. It is evident here that the contractor will be the most affected by these two claim causes. The owners and consultants might as well fell the weight of association, but surely to a less degree. The claim cause on dispute on reimbursement of owner caused delay will have its association with the ***money*** variable first and then on the ***time*** variable if the claim is not settled on time by the owner or consultant. The effect of this claim is minimal on consultants and owners. The claim on dispute on reimbursement due to owner- directed acceleration will no doubt affect the ***money*** factor, as this acceleration will cause an increase in the expenses of the contractor in order to complete the project. These expenses are mainly on lost productivity due to the acceleration and other increase in labour, machinery and management cost. This claim on directed acceleration might have little or no with the ***time*** variable. The weight of association with contractors will be the greatest followed by the other two parties. This kind of claim (the directed acceleration claim) is not yet professionally dealt with, either by contractors, consultants or owners. There is no appreciation yet by owners or consultants to the weight of association with the ***money*** variable that this claim has. Even contractors do not know how to prepare a good claim built on this ground. Courts follow the point of view of the

experts they appoint to look into such claims. There are few experts that can deal with such claims in Saudi Arabia. Evidently there is a space for improvement in such an area for all the three parties to a project. The dispute on reasonable time extension could be caused by any or all of the project parties. It might affect the ***time*** variable if not settled on time. It might as well have an association with the ***money*** variable if it were not settled and the contractor had to finish on time without the reasonable time extension. This could cost him money for acceleration, as discussed above, or might lead him to incur delay penalties. This claim cause will no doubt be felt most by the contractor, then by the other two parties. The dispute on the fair market value for variation orders could be due to any or all of the project parties. This is a dispute that is seen in many construction projects in Saudi Arabia. It could easily be dealt with if some precautions are taken during the bid and award stage. Some prices for provisional work might be added to the bills of quantities and a mechanism for settling such disputes could be added to the contract. If such claims are not settled fairly, the ***money*** variable will surely be affected. The ***time*** variable could be associated if due to delays in settling the claim, the contractor had to overrun the completion date due to financial problems. This claim will be felt by the contractor more than the other two parties. The claim on timing of variation orders is usually due to owners, who want to make changes in their project, irrespective of the construction phase or the time left before completion date. This claim might also be due to consultants' actions or omissions, and in some instances, to make far the faults in design drawings or specifications. This problem could be overcome by the owner and consultant each doing his homework early in the project and doing all the thinking jobs before a site is handed over to a contractor. In some cases variation orders given in unsuitable times are enevitable. The weight of association with this claim

cause is clear on the ***time*** variable. It might also be associated with the ***money*** variable if, due to giving variation orders in an unsuitable time, causes an increase in costs and overhead to a contractor. Evidently a contractor is the party most associated with such a claim cause. The other two parties might be associated with it to a lesser degree. The claim on variation orders not paid on time is usually due to owners. In government projects, the usual practice is that variation orders are only paid at the end of the project. The government point of view is that their might be omissions, or negative variation orders, and that will only be clear to calculate at the end of the project. Contractors have a different point of view, but still the practice is the same in public projects. Private sector projects do not have a system to follow in this regard, but delay in payments, whether for original or additional work, is a universal problem in the Saudi construction industry. Contractors can take down their prices if they know beforehand that they will be paid on time. They surely will calculate the value of not being paid on time, and add that to their price. The construction industry can save millions if it regulates its attitude of payments, and large clients, like the service ministries, will save a handsome percentage of their construction budgets if they guarantee on time payments to contractors. This claim cause will be associated with the '***time***' and '***money***' variables and contractors will be more associated with it than owners or consultants, because they are the ones that will wait for the delayed payments until settled, with what if takes to finance the work through their own means. The claim on too many variation orders is either caused by owners who do not fully make up their minds on their choices during the design stage, or by consultants, who have to make up for their faulty or incomplete work in the design and specification stage. This problem could be overcome by taking enough time for the design stage with full liaison between the designer and the owner to insure that

the latter's needs are met. It could also be overcome be choosing the right consultant to design the project and paying him the suitable fees. This claim on too many variation orders will surely have an association with both variables ***time*** and ***money***. Contractors will surely feel the weight of association of this claim cause more than the other two parties, who will still feel some of the weight of association. The claim on the consultant being not cooperative is evidently caused by consultants. There is a tendency in Saudi Arabia of consultants being harsh or non cooperative with contractors as a sign of neutrality and to impress the owners. Some owners too encourage contractors to do so. These are usually uneducated owners of usually small projects. Institutional and educated owners understand the need for good and smooth cooperation of the consultant and contractor to the outcome of the projects. Learned consultants will take the right steps to make sure that the project runs smoothly. This claim cause could have an association with the ***time*** and ***money*** variables. The weight of association will be felt more by the contractor, but will also be felt by the two other parties (the owner and consultant). The claim cause on poor documentation could be due to any party to a project. Contractors followed by consultants are the ones that need good documentation most. Contractors cannot make real claims unless they support them with the necessary documents, and if they do not keep record of every document and action or omission, they could easily lose their case. Owners too need with their consultants to have a good documentation system, in order to be able either to initiate or defend any claim against the contractor. In practice, small contractors in Saudi Arabia are usually very poor on documentation. Some medium sized contractors are better organized, and the larger the contractor, the better documented he will be. Some of the large contractors and some international contractors have computer aided tracking systems, for

documents that aid in preparing reports and claims as well. The government still needs to improve on this side, and many a claim was lost by a public agency due to poor documentation. This claim cause may be associated with the ***time*** factor and could be associated with the ***money*** factor as well. It will be felt equally by all sides, especially by contractors and owners. There is an area here for upgrading and improvement in the local construction industry. The claim cause on absence of a dispute resolution method in the contract could mainly be due to owners who draft their contracts. Model construction contracts like the JCT or FIDIC contracts are not so popular in Saudi Arabia. Most small owners in the private sector draft themselves their contracts, take a copy contract from a friend or leave that job to the contractor. Medium and large owners and contractors get the help of an in house law expert or hire the services of a lawyer to draft their contracts. Public agencies and ministries have their own model of contract, which is the contract of Public Works, in which the only method of dispute resolution is to resort to the Board of Grievances for settlement of any dispute. Private owners sometime resort to arbitration which is growing public nowadays. Rarely will they mention other methods or techniques of dispute resolution such as mediation or conciliation. The problem arises when the contract is silent on any dispute resolution method. In such a case the only choice the parties have is either to go to the Board of Grievances (if both parties have a commercial identity) or go to the High Sharia court if one of the parties is an individual, which is the case with most small projects. This claim cause will undoubtedly be associated with the ***money*** variable. The weight of association will be felt by both the owner and the contractor. The consultant will feel less the weight of association except in the case he is a party to a dispute with the owner. The claim cause on poorly prepared contract documents (either ambiguous contradicting or

incomplete) is mainly caused by consultants. It could be by owners if they have a role in this preparation. The cure for such disputes is in the owner's hand. He has to choose the competent consultant, reward him with the fair fees and give him enough time to prepare the contract documents which might include the design and detailed drawings, bills of quantities, specifications, contract form, among other possible documents. The absence of a professional code of practice and a schedule of fees complicate the problem further. This claim cause will be associated with the ***money*** variable and could be associated with the ***time*** variable as well. The weight of association will be felt by both the contractor and the owner and to a lesser extent by the consultant, who will try to conceal his faults if he were the one who prepared the documents, or to enlarge them if he were only the supervising consultant. The claim on disputes on nominated sub-contractors would be caused by the contractor who works as a main contractor. This is not a big issue in the Saudi construction market. In public projects owners are not allowed to nominate any specific contractor or supplier. This is intended to help with free competition between sub contractors or suppliers. Nomination is allowed in the private sector although not much used by private owners, yet some problems arise from this nomination. The less nomination of sub contractors the less disputes will arise from such nomination. This claim cause is most felt by contractors. Owners too may be associated with this claim and the least associated will be consultants. This claim cause might impact the ***time*** and the ***money*** variables independently or jointly.

### 4.2.5) Summary

The previous discussion showed that the weight of association by the information and technical based claim group was the highest

regarding the ownership of a project, with the weight of association with government projects slightly higher than that on private projects. The second weight of association with ownership was by the contract administration group of claims, which showed slightly higher weight of association with private projects than government ones. The highest associated factors were ***time*** followed by ***money*** and ***operation***. The process group was the highest associated followed by the business consequences group, while the product group came last. Regarding the parties to the project the discussion showed that the information based claims had also the highest weight of association, followed by the contract administration claim group. Consultant were the highest associated with the information based claim group, while contractors were the least associated. Those same contractors were the highest associated with the contract administration group of claims. The ***time*** and the ***money*** variables felt the highest weight of association of the eight dependent variables, and consultants were most sensitive to the ***time*** variable while contractors felt strongly about the ***money*** variable. The process group felt the highest weight of association, followed by the business consequences group. The product group of variables felt the least of weight of association.

# Chapter 6: Discussion of the Twelve Highest Claim Causes

## Introduction

This chapter discusses the **association** of the highest twelve claim causes regarding three axes; parties to the project (owner, contractor and consultant), ownership of the project (government or private), and the size of a project (small, medium and large). The normalised weights of the claims' **effect of association** will be discussed for each of the three parties in a project, as well as each party's opinion of the party causing each claim. The claim groups from which the highest twelve claims come from will also be discussed. A comparison between government and private ownerships will give some insight on the difference in opinion of the three parties to a project on the highest **associated** claims in each ownership group. The same discussion will apply to the three sizes of a project (small, medium and large) and a final look at the highest twelve claim causes will follow regarding the total sample.

## 6.1) Parties to the project:

After analysing the responses in the questionnaire the results of the heighest twelve claim causes for the three parties to the project will be discussed herein.

### 6.1.1) Owners

The owners ranked their highest twelve causes of claims with their respective weights as follows:

| Code | Claim | Caused by | Rank | Weight |
|---|---|---|---|---|
| IB1 | Construction Defects | (Cont) | 1 | 3.28 |
| IB5 | Poor Technical Skills of Contractor | (Cont) | 2 | 2.96 |
| IB8 | Contractors Poor Management | (Cont) | 3 | 2.44 |
| CA6 | Disputed Compensations | (All) | 4 | 1.96 |
| CA2 | Late Payments | (Own) | 5 | 1.92 |
| IB24 | Incomplete Specs | (Cns) | 6 | 1.92 |
| IB33 | Design not compatible to local level of contractors | (Cns) | 7 | 1.72 |
| IB37 | Incomplete Drawings | (Cns) | 8 | 1.72 |
| CA8 | Disputed time Extension | (All) | 9 | 1.72 |
| CA18 | Incomplete documents | (Cns) | 10 | 1.68 |
| 1B11 | Variation order pricing | (All) | 11 | 1.68 |
| | Total of highest twelve claim causes | | - | 24.56 |

**Table (6-1) The highest 12 causes of claims with respective weights (Owner's opinion)**

It is obvious here that owners put those claims caused by contractors as their first rank blaming the technical and managerial skills of contractors. This as expected showed that owners see contractors as the major cause of claims of the parties to the project. Owners confess their involvement in causing claims by admitting that late payments are a major cause of claims and ranking this claim as number five out of twelve. This is the only time owners see themselves as causing any major claim. They then move to consultants seeing them as the second cause of claims by criticising their performance, some times as incomplete or not compatible to the local level of contractors, thus criticising their knowledge of the local construction environment. Other causes of claims ranked by owners could be jointly blamed by any or all parties like those claims of disputed compensations, disputed time extensions and variation order pricing.

Owners saw themselves causing only 9% of the twelve highest claim causes, while they thought contractors and consultants were to blame for 33% each and 25% was caused jointly by two or all parties. The 'information based' group of claims constituted 8 out of the 12 highest claim causes in owners' opinion (67%) while the 'contract administration' based group of claims constituted 4 out of the group (33%). This shows that owners put great weight on matters of information in the project and that they see a great need to upgrade contractors and consultants in this field.

### 6.1.2) Contractors

Contractors ranked their highest twelve causes of claims with their receptive weights as follows:

| Code | Claim | Caused by | Weight | Rank |
|---|---|---|---|---|
| CA2 | Late Payments | (Own) | **3.1** | **1** |
| CA13 | Consultant not cooperative | (Cns) | **2.36** | **2** |
| IB37 | Incomplete Drawings | (Cns) | **2.38** | **3** |
| IB13 | Drawings Approval | (Cns) | **2.1** | **4** |
| 1B11 | Variation order pricing | (All) | **2.0** | **5** |
| CA10 | Variation order timing | (Own) | **1.96** | **6** |
| IB15 | Material Approval | Own/Cns | **1.91** | **7** |
| CA11 | Variations late Payment | (Own) | **1.83** | **8** |
| CA12 | Variations too many | Own/Cns | **1.72** | **9** |
| IB16 | Late check by consultant | (Cns) | **1.72** | **10** |
| IB6 | Owners poor tech. Level | (Own) | **1.69** | **11** |
| CA4 | Failure by owner | (Own) | **1.69** | **12** |
| | Highest twelve claim causes | | **23.86** | |

**Table (6-2) The highest 12 causes of claims with respective weights (Contractor's opinion).**

It is obvious here that contractors see owners and consultants as the major cause of claims, putting late payments at the top of the twelve highest claim causes. They blame consultants for their uncooperative attitude and see some problems with their handling of time, ranking late drawings, material and work approvals among the highest claim causes. Contractors also blame owners for wrong variation order timing and too many of them while delaying the payment for those variations. They also blame owners for their poor technical skills, which might be in private projects where owners might employ low cost consultants or do some technical work themselves. Unlike owners, contractors did not mention claims for which they may be blamed themselves, concentrating on those claims caused by owners and consultants only. Contractors saw owners, or owners jointly with consultants, as causing 58% of the highest twelve causes, while seeing consultants, or consultants jointly with owners as causing 40% of the highest twelve causes, while seeing all parties possibly responsible for 8% of those claims (namely variation order pricing which could be caused by any or all of the three parties to a project). The twelve highest claim causes in contractors' opinion were evenly split between **'information based claims'** (50%) and **'contract administration based claims'** (50%). This shows that contractors feel the same need to upgrade the information side of management in owners and consultants and at the same time to upgrade the contract management practices of the two parties to the project (owners and consultants).

### 6.1.3) Consultants

Consultants ranked their highest twelve causes of claims with their respective weights as follows:

| Code | Claim | Caused by | Weight | Rank |
|---|---|---|---|---|
| IB8 | Contractors Poor Management | (Cont) | **3.72** | **1** |
| IB5 | Poor Technical Skills of Contractor | (Cont) | **3.52** | **2** |
| CA2 | Late Payments | (Own) | **3.10** | **3** |
| IB1 | Construction Defects | (Cont) | **2.89** | **4** |
| 1B11 | Variation order pricing | (All) | **2.48** | **5** |
| IB10 | Low Bidding | (Cont) | **2.48** | **6** |
| IB33 | Poor Quality work | (Cont) | **2.22** | **7** |
| CA18 | Incomplete documents | (Cns) | **2.20** | **8** |
| IB30 | Poor Scheduling by Contractor | (Cont) | **2.02** | **9** |
| CA8 | Disputed time Extension | (All) | **1.85** | **10** |
| Sc2 | Subsurface Conditions | (None) | **1.80** | **11** |
| CA10 | Variations timing | (Own) | **1.74** | **12** |
| | Highest twelve claim causes | | **30.02** | |

**Table (6-3) The highest 12 causes of claims with respective weights (consultants' opinion)**

As is expected, consultants see mainly contractors' poor management and poor technical skills at the top of the causes of claims. They also blame contractors for construction defects and poor quality of work, of low bidding and poor scheduling. Consultants blame owners too, with a lesser degree, for late payments and improper variation order timing. They see themselves responsible (only once) in supplying incomplete documents as a cause of claim. They see all parties as responsible for claims based on variation order pricing and disputed time extension, while blaming all parties (or none sometimes) for

claims based on subsurface conditions. Consultants put contractors as a cause for 50% of the highest twelve causes, while putting owners (or owners together with consultants) as responsible for 17% and putting themselves as responsible, or jointly responsible with owners, for 17% of the causes of claims of the twelve highest claim causes. They put all parties to a project, or any one of them, responsible for 25% of the causes, namely variation order pricing and subsurface conditions. The twelve highest causes of claims in consultants opinion show 58% of the causes arising from **'information based'** claims, while 33% arising from **'contract information'** based claims, while 9% arise from **'subsurface condition'** based claims. It is obvious here that consultants are looking to see contractors upgrade their technical and managerial skills, and those information based skills too. Table (6-4) and Table (6-5) below show a comparison between the three parties to the project in this regard.

| | Owners | Contractors | Consultants | All parties |
|---|---|---|---|---|
| **Owners** | 9 % | 33 % | 33 % | 25 % |
| **Contractors** | 58 % | 0 % | 40 % | 8 % |
| **Consultants** | 17 % | 50 % | 17 % | 25 % |

**Table (6-4) Opinion of each party as to the percentage of other parties causing claims.**

| | Information Claims | Contract Administration | Site Conditions |
|---|---|---|---|
| **Owners** | 67 % | 33 % | - |
| **Contractors** | 50 % | 50 % | - |
| **Consultants** | 58 % | 33 % | 9 % |

**Table (6-5) Opinion of each party as to the percentage of claims arising from each claim group.**

### 6.1.4) General overview

The overall weight of **association** of the twelve highest claim causes by owners was 24.56, that by contractors was 23.88 and that by consultants was 30.02. It is clear here that the **impact** felt by consultants is the largest of the three parties to the project. This could be due to that consultants live the project day by day, unlike the owner, and that consultants being better educated than an average contractor so could feel or even calculate the **weight of association** of different claims on the project. See Fig (6-1) below for a comparison between the three parties.

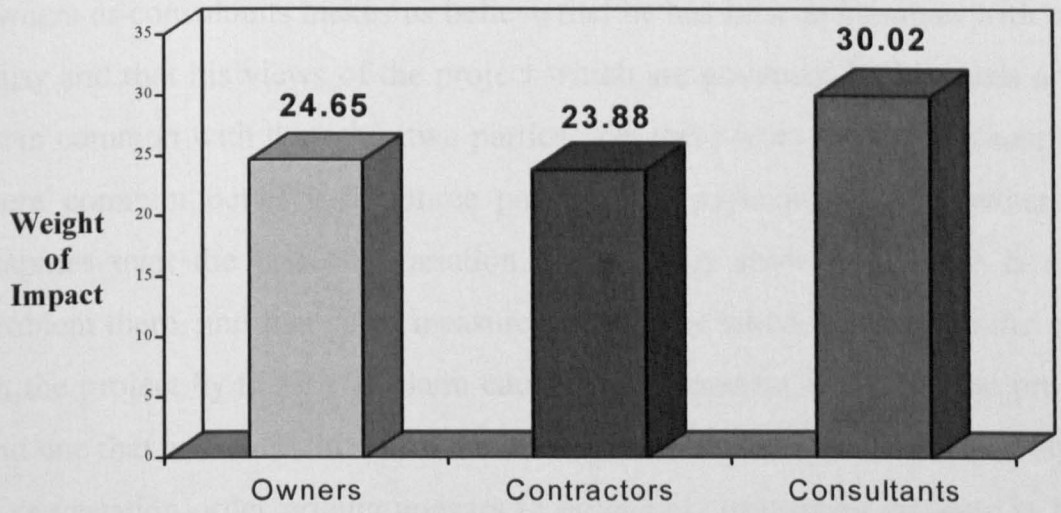



**Fig (6-1) Overall association of the 12 highest claim causes on the three parties to the project.**

Most of the claim causes mentioned by the three parties was from the **'information based'** category (58%), and those claim causes based on the **'contract administration'** category amounted for 39%, while claims based on **'subsurface conditions'** amounted for 3% only. The other three categories were not represented in the twelve highest claim causes chosen by the three parties. This indicated that there is room for improvement in the information management of the three parties to the project as a priority, and that contract administration procedures and techniques also need some sharpening. The

overall number of claim causes deduced from the results as the twelve highest by the three parties was twenty four. There is an overlap in ten claim causes only between two or all of the parties. There was an overlap of eight claim causes between owners and consultants while only three overlaps between contractors and consultants, from the one hand, and contractors and owners from the other hand. Yet each party gave a different weight to those claim causes in common with another party. This shows that owners and consultants have common views of a considerable percentage of claim causes (8 out of 16 causes) mentioned by both parties. This strengthens the belief that both work as one group or team against the contractor. The latter who only shares three claim causes with either owners or consultants makes us believe that he has little in common with either party and that his views of the project which are governed by his goals are far from common with the other two parties. Yet there were two claim causes that were common between the three parties: late payments by the owner, and disputes over the price of variation orders. This shows that there is a real problem there, and that some measures have to be taken to minimise the **effect** on the project by those two claim causes. Late payment is a universal problem and one that is **association with** the economic cycles and environment. Disputes over variation order pricing appears to be heavily **impacting** projects in Saudi Arabia. A good mechanism ought to be included in public and private contracts to deal with this problem. The common ground between owners and consultants revolves on the technical and managerial weakness of contractors. It also includes that which relates to owners (late payment) and that relating to consultants (incomplete documents). Aside from the common claim causes mentioned above, there is only one more claim cause common between owners and contractors: (incomplete drawings), and only one common between contractors and consultants (wrong variation timing). The above results show that owners and consultants admitted some responsibility in causing some claims. On the contrary contractors did not think of themselves as causing any major claim but that the other two parties to the project are to blame for the

major causes of claims. Owners had three exclusive causes of claims in their twelve highest. Those were: disputed compensations, incomplete specifications and design not compatible with local level of contractors. Although consultants gave it a smaller weight (thus not appearing in their highest twelve causes) contractors on the other hand gave it a weight of zero. That means that not a single contractor from those filling in the questionnaire (which totalled twenty nine) thought of himself as not able to construct whatever consultants can design. Consultants too had three exclusive causes of claims in their twelve highest; those were: low bidding by contractors, poor scheduling by contractors (which contractors gave it a weight of zero thus not believing at all in this view) and subsurface conditions. The latter cause could be the fault of the consultant, or jointly with either the owner or contractor. Alternatively it could be nobody's fault and it is so in many cases. Contractors had eight unique causes which strengthens the belief that contractors have their own view of the consultant and owner. They blame consultants as not being cooperative and being late in material and drawings approval and late work checking. On the other hand they blame owners for too many variation orders, late payment of variation orders, poor technical level of the owners' personnel and failure by owners to fulfil their contractual obligations. These exclusive causes of claims not shared between any two parties show that although there are some similarities, yet there are some different views between the parties; between owners and consultants (minimal) but are major between contractors and the other two parties. The following is a comparison of all three parties to a project:

| Code | Claim | Caused by | Contractors | | Consultants | | Owners | |
|---|---|---|---|---|---|---|---|---|
| | | | Rank | Weight | Rank | Weight | Rank | Weight |
| IB1 | Construction Defects | (Cont) | - | 1.03 | 4 | 2.89 | 1 | 3.28 |
| IB5 | Poor Technical Skills of Contractor | (Cont) | - | 0.52 | 2 | 3.52 | 2 | 2.96 |
| IB8 | Contractor's Poor Management | (Cont) | - | 0.34 | 1 | 3.72 | 3 | 2.44 |
| CA6 | Disputed Compensations | (All) | - | 0.69 | - | 1.3 | 4 | 1.96 |
| CA2 | Late Payments | (Own) | 1 | 3.1 | 3 | 3.1 | 5 | 1.92 |
| IB24 | Incomplete Specs | (Cns) | - | 1.3 | - | 1.52 | 6 | 1.92 |
| IB33 | Design not compatible to local level of contractors | (Cns) | - | 0 | - | 1.33 | 7 | 1.72 |
| IB37 | Incomplete Drawings | (Cns) | 3 | 2.38 | - | 1.09 | 8 | 1.72 |
| CA8 | Disputed time Extension | (All) | - | 1.31 | 10 | 1.85 | 9 | 1.72 |
| CA18 | Incomplete documents | (Cns) | - | 1.52 | 8 | 2.2 | 10 | 1.68 |
| 1B11 | Variation order pricing | (All) | 5 | 2.0 | 5 | 2.48 | 11 | 1.68 |
| IB33 | Poor Quality work | (Cont) | - | 0.13 | 7 | 2.22 | - | 1.56 |
| CA13 | Consultant un cooperative | (Cns) | 2 | 2.38 | - | 1.09 | - | 1.56 |
| IB13 | Drawings Approval (late) | (Cns) | 4 | 2.1 | - | 1.33 | - | 1.52 |
| CA10 | Variation order timing | (Own) | 6 | 1.96 | 12 | 1.74 | - | 1.44 |
| IB15 | Material Approval (late) | (Cns) | 7 | 1.91 | - | 1.85 | - | 1.52 |
| CA11 | Variations Payment (late) | (Own) | 8 | 1.83 | - | 1.26 | - | 1.56 |
| CA12 | Variations too many | (Own) | 9 | 1.72 | - | 1.54 | - | 1.12 |
| IB16 | Late check by consultant (of work) | (Cns) | 10 | 1.72 | - | 1.22 | - | 0.96 |
| IB6 | Owners poor tech. Level | (Own) | 11 | 1.69 | - | 0.96 | - | - |
| CA4 | Failure by owner (of contr. obligt) | (Own) | 12 | 1.69 | - | 0.67 | - | 0.96 |
| IB10 | Low Bidding | (Cont) | - | 0.51 | 6 | 2.48 | - | 1.32 |
| IB30 | Poor Scheduling by Contractor | (Cont) | - | 0.00 | 9 | 2.02 | - | 1.20 |
| Sc2 | Subsurface Conditions | (None) | - | 0.72 | 11 | 1.8 | 12 | 1.68 |
| | Highest twelve claim causes | | - | 23.88 | - | 30.02 | - | 24.56 |
| | Total of 24 claim causes | | - | 31.96 | - | 45.18 | - | 39.76 |

**Table (6-6) A comparison of the three parties' response to claims and their respective weights for the 12 highest in each party.**

## 6.2) Ownership

After analysing the responses in the questionnaire, the results of the highest twelve claim causes for the two categories of ownership of a project will be discussed herein.

### 6.2.1) Government

From the analysis, government projects had these twelve claim causes as the highest, with their respective weights, as follows:

| Code | Claim | Caused by | Government | |
|---|---|---|---|---|
| | | | Rank | Weight |
| CA2 | Late Payments | (Own) | 1 | 3.44 |
| 1B11 | Variation order pricing | (All) | 2 | 2.58 |
| IB8 | Contractors Poor Management | (Cont) | 3 | 2.26 |
| IB30 | Poor Scheduling by Contractor | (Cont) | 4 | 2.0 |
| IB10 | Low Bidding | (Cont) | 5 | 1.97 |
| IB5 | Poor Technical Skills of Contractor | (Cont) | 6 | 1.89 |
| IB39 | Differences in BOQ | (Cont) | 7 | 1.79 |
| IB13 | Date Drawings Approval | (Cns) | 8 | 1.76 |
| CA8 | Disputed time Extension | (All) | 9 | 1.73 |
| IB1 | Construction Defects | (Cont) | 10 | 1.63 |
| IB27 | Late Drawing by Contractor | (Cont) | 11 | 1.58 |
| CA10 | Variation order timing | (Own) | 12 | 1.55 |
| CA5 | Work Stoppage | (All) | | 0.79 |
| IB37 | Incomplete Drawings | (Cns) | | 1.03 |
| IB24 | Incomplete Specification | (Cns) | | 1.08 |
| CA13 | Too many Variation Orders | Own / Cns | | 0.97 |
| | Highest twelve claim causes | | | 24.18 |
| | Total of 16 claim causes including 4 mentioned in private projects for comparison | | | 28.05 |

**Table (6-7) The highest 12 claim causes with respective weights in government projects.**

We can see from the table above that late payments are the main claim cause in government projects. After the oil boom was over the country went into some financial and economic difficulties that resulted in late payments for contractors. The Gulf War in 1990-1991 put the country into debt which worsened the government's cash flow. Falling oil prices added to the difficulties, but things improved after oil prices rose and waiting time to get paid shortened. Yet the problem is still there. Contractors usually compare their current situation with that during the boom days when they were paid promptly and with advance payments as large as 20%, which greatly helped their cash flows. This cause of claim will decrease inversely proportionate to the economic health of the country. Although the first of the twelve highest claim causes is caused by owners, yet the majority of the rest is due to contractors and consultants. Variation order pricing could be traced to all or some of the parties. It is clear that this is a problem, as there was a consensus of the three parties as this cause as being one of the major ones. Here, in government projects, it ranked second. Government agencies should take a step towards addressing this problem, probably by including some new measures in the government construction contract to cover this point. The current situation is that contractors ought to perform all variation orders issued by the owner, or the owner's consultant, and then discuss the prices during or after performing the work. Obviously there is a problem here, and this matter has to be seriously addressed by all parties. The four following causes of claims all relate to contractors, starting from poor management skills to poor scheduling and technical skills and low bidding prices. This shows that the system used in government to accept the lowest bidder and award him a contract is showing its negative side. Bidders should be judged on both technical and financial bids, and that could minimize claims arising from poor technical and managerial skilled contractors. The following two causes of claims could be traced to consultants. Large differences between BOQs and drawings are a major cause of claim to which consultants have to pay more attention. This could either be due to consultants lacking competency or

not being given enough time to finish their jobs, or not being paid adequately. The second cause attributed to consultants is late or delay in drawings approval. Consultants have no reasons to do that, and a schedule of approvals should be drafted and followed by all parties to avoid such delays. The following claim cause is the disputed time extension where in government projects, as with variation order pricing, all claims for extensions of time are not addressed by the owner representative or his consultant until the end of the project. This problem has to be addressed to the satisfaction of all parties probably by settling the time extension claims promptly and awarding extension of time to contractors accordingly during the project time and not leaving them to the end for discussion. The next two causes are caused by contractors, namely construction defects and late submittal of drawings by contractor. The earlier discussion on awarding contracts to lowest bidders in government projects is applicable here too. Contractors' unions should be encouraged to put standards of workmanship for contractors and try to upgrade its members in order to minimize claims based on poor contractors' technical and managerial skills. The last of the twelve highest claim causes in government projects is attributed to owners which is the variation order timing. It seems the bureaucratic attitude of government employees affects the way they respond to the needs of variation in a project. Their tardiness creates claims. Consultants can sometimes be jointly, with owners, blamed for this. Sometimes government employees complain of being over loaded with work which results in their delay to respond to variation orders in projects. In the absence of true accountability it will be hard to ameliorate the problem. Owners appear as the cause of 17% of the claim causes, contractors as 50% of the causes, consultants for 17% of the claim causes and all the parties for 16% of the causes. See Fig (6-2) below.

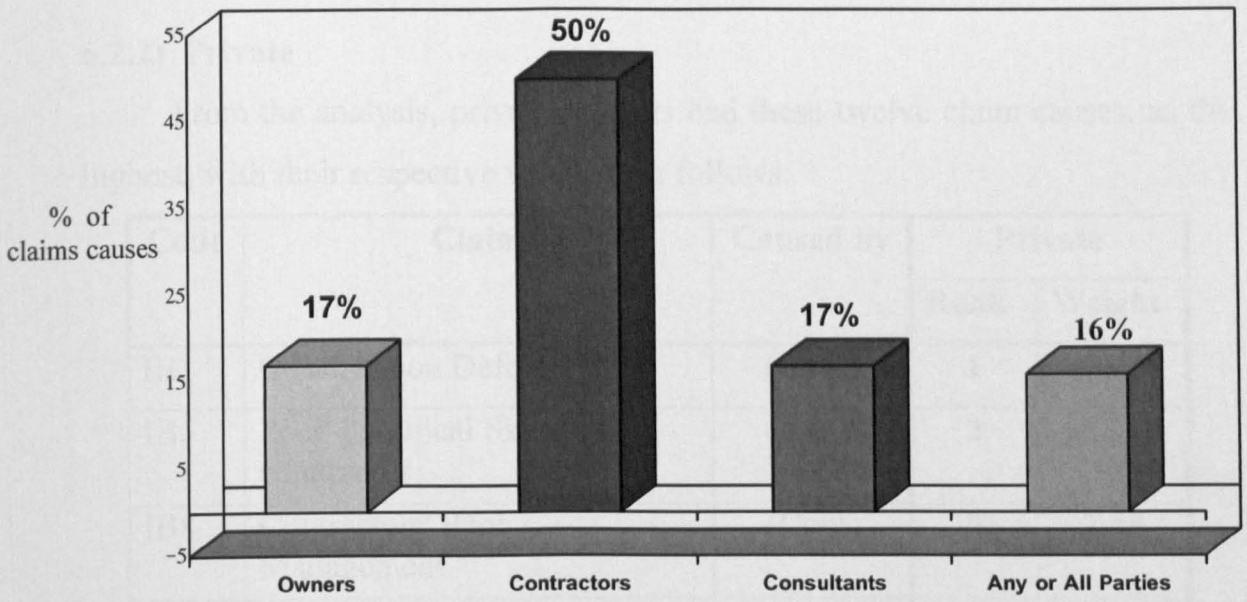



**Fig (6-2) Parties participation in claim causes in government projects.**

**'Contract administration based'** claim causes accounted for 25% of the causes in government projects, while 75% of the causes where from the **'information based'** claims category. This shows the need to upgrade the skills of all parties working in governmental projects in the field of information management, while also paying attention to the contract administration skills of the three parties to a project. See Fig (6-3) below

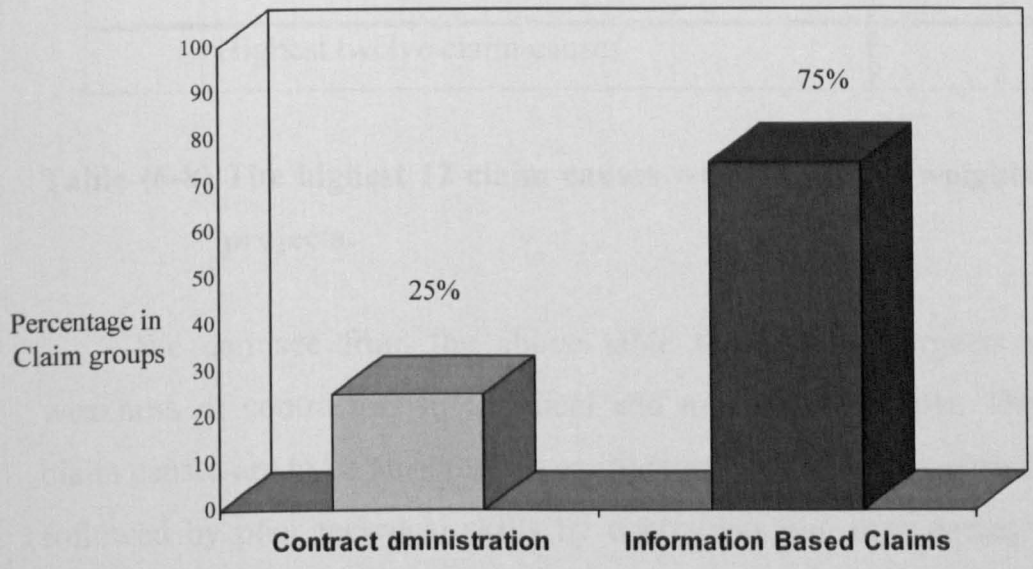



**Fig (6-3) Percentage of claim groups in the highest 12 claim causes in government projects.**

### 6.2.2) Private

From the analysis, private projects had these twelve claim causes, as the highest, with their respective weights, as follows:

| Code | Claim | Caused by | Private | |
|---|---|---|---|---|
| | | | Rank | Weight |
| IB1 | Construction Defects | (Cont) | 1 | 2.93 |
| IB5 | Poor Technical Skills of Contractor | (Cont) | 2 | 2.92 |
| IB8 | Contractors' Poor Management | (Cont) | 3 | 2.48 |
| CA2 | Late Payments | (Own) | 4 | 2.37 |
| CA5 | Work Stoppage | All / None | 5 | 2.35 |
| IB37 | Incomplete Drawings | (Cns) | 6 | 1.94 |
| 1B11 | Variation order pricing | (All) | 7 | 1.87 |
| CA10 | Variation order timing | (Own) | 8 | 1.87 |
| IB24 | Incomplete Specifications | (Cns) | 9 | 1.85 |
| CA8 | Disputed time Extension | (All) | 10 | 1.63 |
| CA13 | Too many Variation Orders | Own / Cns | 11 | 1.60 |
| IB13 | Late Drawings Approval | (Cns) | 12 | 1.60 |
| | Highest twelve claim causes | | | 25.41 |

**Table (6-8) The highest 12 claim causes with respective weights in private projects.**

We can see from the above table that private projects suffer from weakness of contractors in technical and management skills. The first three claim causes are to be attributed to contractors. The first is construction defects, followed by poor technical skills by contractors and then comes contractors' poor management. It is evident here that contractors' selection is also a problem as is the case with government projects. Late payment by owners comes as

number four, still a problem with private projects, and probably has do with the economic conditions in the country , but also is a factor of the culture of owners in Saudi Arabia who think that contractors usually overcharge them, thus paying late will not hurt the contractor. Probably adding a penalty to the contract for late payments could help minimise this problem although attention should be given to Sharia' matters not to clash with its basics. The next cause is work stoppage which could be due to any party to a project and could also be due to other parties out side the project or due to circumstances out of the hands of the three parties. Still this poses a threat to projects and thorough attention should be given to causes of this claim. Consultants are then present in the list as causes of claims built on incomplete specifications. This might be due to that there is no governing body in Saudi Arabia to truly supervise consultants' work. If existing bodies were to be reactivated these problems would be minimised. Variation order pricing and variation order timing claims which could be caused by owners or jointly with consultants can be minimised if given enough attention in the contract before commencing construction. Disputed time extension claims are also a threat to private projects as they are to government ones. It seems owners postpone any decision on time extension till the end of the project and it also seems that contracts in private projects do not address this subject clearly or thoroughly. The next claim cause is that of too many variation orders, which could be due to owners or jointly with consultants who might produce incomplete sets of drawings leading to lots of variation orders or owners might change their minds a lot during construction or might not have understood their project in detail during the design phase or might not have conveyed all their thoughts to the architect and might like to make lots of changes during construction to realise their dreams. The last of the twelve highest claim causes is that of late drawing approval. Clearly this is the mistake of consultants. If owners were to monitor their consultants' performance, or that professional societies were to supervise their members' performance or at least to publish the professional standards of performance, such mistakes could be minimised.

Contractors make up the cause of 25% of the twelve highest claim causes in private projects, while owners make up , or jointly with consultants another 25% of the total. Consultants, or jointly with owners make up 33% of the twelve highest claim causes. All parties, or none of them constitute 25% of the total. It is clear here that all parties to the project are almost evenly responsible for the highest twelve claims in private projects, with contractors coming at the top of the list. See Fig (6-4) below.

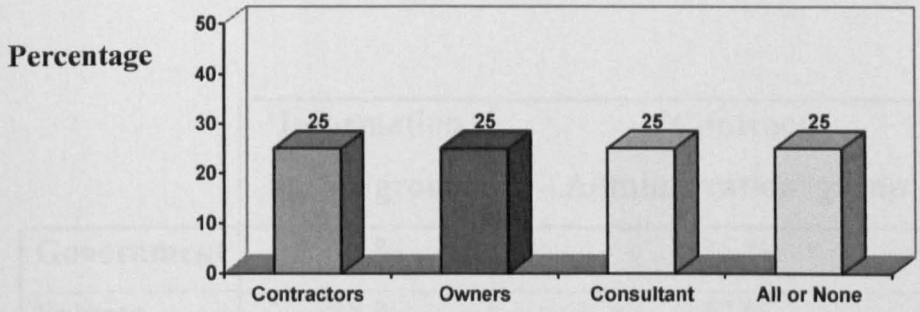



**Fig (6-4) Parties participation in claim causes in private projects**

**'Information based'** claim causes make up 58% of the twelve highest claim causes while **'contract and administration based'** causes of claims make up the balance (42%). This shows that improvement in information, as well as contractual management, is required in the private sector to minimise the claims and the problems arising there from. See Fig (6-5) below

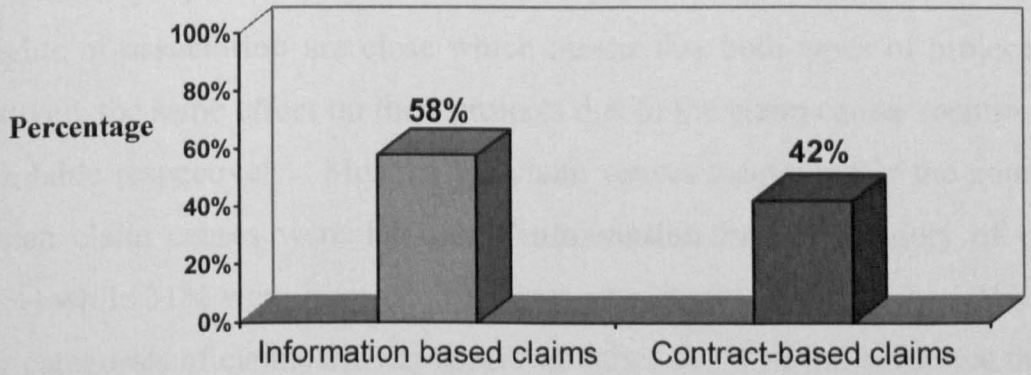



**Fig (6-5) Percentage of claim groups in the highest 12 claim causes in private projects**

| | Government | Private |
|---|---|---|
| **Owners** | 17 % | 25 % |
| **Contractors** | 50 % | 25 % |
| **Consultants** | 17 % | 33 % (some overlap with consultants) |
| **All parties** | 16 % | 25 % |

**Table (6-9) Perecentage of causing claims by each party in relation to ownership**

| | 'Information based' group | 'Contract Administration' group |
|---|---|---|
| **Government** | 75 % | 25 % |
| **Private** | 58 % | 42 % |

**Table (6-10) Percentage of claims in each claim group in relation to ownership**

### 6.2.3) General overview

The overall weight of **association** of the twelve highest claim causes in government projects was 24.18 and that in private projects was 25.41. The two weights of **association** are close which means that both types of projects feel relatively the same **effect** on their projects due to the claim causes mentioned in each table respectively. Most of the claim causes mentioned in the combined sixteen claim causes were from the **'information based'** category of claims (69%) while 31% were from the **'contract administration'** category. The other four categories of claims did not appear in either list. This indicates that there is mainly a need to improve the information management of the three parties to the project. Yet improvement in contract administration should not be overlooked.

The total number of claim causes mentioned in the two lists was sixteen with an overlap of eight claim causes between government and private projects. The common causes included late payments, variation order pricing, contractors' poor management, poor technical skills by contractor, late drawings' approval, disputed time extension, construction defects and late submittal of drawings by contractor. Both types of ownership suffered similar problems here. Exclusive to government projects was the claim cause of poor scheduling by contractor, low bidding, differences between BOQs and drawings and late submittal of drawings by contractor. Although these claims ranked low in the private projects list (i.e outside the twelve highest), yet still the private sector suffers from them although in less intensity. Not every contractor in the private sector is required to submit an advanced schedule, and the private sector does not always choose the lowest bidder, BOQs are not always used in the private sector as many private projects are on lump sum basis and lastly not all contractors in private projects are asked to submit any drawings at all. Exclusive to public projects were the claim causes of work stoppage, incomplete drawings, incomplete specifications and too many variation orders. Although these claims ranked low in the private projects list, yet it seems government projects suffer from them in less intensity. It seems work stoppage is more regulated in government projects than in private ones where individual owners might stop the work according to their own agenda and less educated contractors of the private sector would not claim for extensions or compensations. Incomplete drawings and incomplete specifications could happen in private projects probably due to that owners do not supervise the work of their consultant, or due to that consultants are underpaid in the private sector where owners are ready to get the cheapest consultant to do their work. Too many variation orders in the private sector may be due to that contract documents are not complete or due to that owners change their minds regularly and might take the advice of wife and relatives in the matters of design and finishing ( in home projects ), which is not the case with government projects. This shows that government and private projects share

almost 67% of the major causes of claims but still have their exclusive causes that differentiate between the two kinds of ownership.

### 6.3) Size of the project

After analysing the responses in the questionnaire, the results of the highest twelve claim causes for the three categories of size of a project will be discussed herein.

#### 6.3.1) Small projects under 5 million Riyals:

From the analysis, the small size projects, which are under 5 million Saudi Riyals, had these twelve claim causes as the highest, with their respective weights, as follows:

Under 5 million Riyals Projects

| Rank | Code | Highest 12 Claims | Caused by | Weight |
|---|---|---|---|---|
| 1 | IB5 | Poor Technical Skills of Contractor | (Cont) | 3.9 |
| 2 | IB1 | Construction Defects | (Cont) | 2.9 |
| 3 | CA18 | Incomplete Contract documents | (Own/Cns) | 2.8 |
| 4 | IB8 | Contractors' Poor Management | (Cont) | 2.5 |
| 5 | IB24 | Incomplete Specs | (Cns) | 2.3 |
| 6 | CA2 | Late Payments | (Own) | 2.2 |
| 7 | 1B11 | Variation order pricing | (All) | 1.9 |
| 8 | 1B3 | Poor workmanship | (Cont) | 1.9 |
| 9 | IB10 | Low Bidding / project under priced | (Cont) | 1.8 |
| 10 | Mm | Force majeure (war) | (None) | 1.6 |
| 11 | IB37 | Incomplete Drawings | (Cns) | 1.5 |
| 12 | Sc2 | Subsurface Conditions | (None) | 1.4 |
| | | Weight of Highest 12 claim causes | | 26.7 |

**Table (6-11) The highest 12 claim causes with respective weights in projects under 5 million Riyals.**

It is obvious from the previous table that these claims are caused by contractors (41.7%) owners/ consultants jointly (8.3%) or owners (8.3%) or consultants separately (25%) and the last quarter was caused by All or None of the three parties to the contract (25%). See Fig (6-6) below.

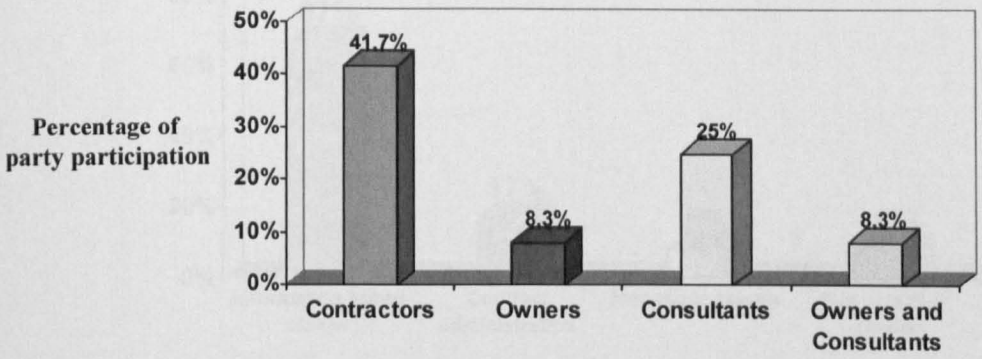



**Fig (6-6) Parties' participation in claim causes in small projects (under 5 million S.R)**

The claims caused by contractors, which ranked high as numbers one, two and four, were poor skills of contractors' technical staff, construction defects by contractor, and poor management. Another cause ranked as number seven and that was poor workmanship. It seems that a large portion of these small projects are constructed by small size contractors, which are in turn weak in technical and management matters. Owners should be careful before awarding their projects to choose the reasonable contractor and not the cheap-priced one. Owners and consultants together were the cause of one of the claims; that of incomplete contract documents. Owners were the cause of the claim of delayed payment and consultants were the cause of the claim built on incomplete specifications and incomplete drawings. Other causes of claims in the table could be jointly caused by all parties or none of them at all. Those that could be due to all parties are claims on disputes on the pricing of variation orders. Those claims not due to any party are the claim on force majeure due to war and the claim on subsurface conditions. The **'information-based'** group of claims

constituted eight out of the twelve highest causes in this category of small size projects (67%). **'Contract administration based'** claims made up two out of the twelve causes which amounted to (17%). **'Man-made causes'** made up just one out of twelve causes amounting to 8% and **'Site-condition based'** claims made up only one out of twelve causes (8%). See Fig (6-7) below.

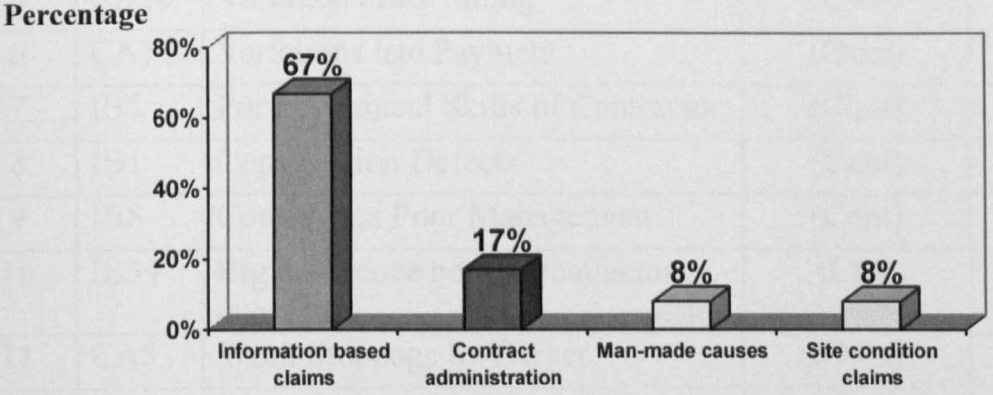



**Fig (6-7) Percentage of claim groups in the highest 12 claim causes in government projects**

This shows that small projects under five million Saudi Riyals suffer much due to matters concerning information, and that this sector of small size projects needs a lot of attention in this regard.

### 6.3.2) Medium projects with a 5-20 Million Riyals size

From the analysis, the medium size projects, which range between five and twenty million Saudi Riyals, had these twelve claim causes as the highest, with their respective weights, as follows:

| Rank | Code | Highest 12 Claims | Caused by | Weight |
|---|---|---|---|---|
| 1 | CA12 | Variations too many | (Own) | **2.5** |
| 2 | CA2 | Late Payments | (Own) | **2.4** |
| 3 | 1B11 | Variation order pricing | (All) | **2.1** |
| 4 | CA6 | Disputed Compensations on delay | (All) | **2.1** |
| 5 | CA10 | Variation order timing | (Own) | **2.1** |
| 6 | CA11 | Variations late Payment | (Own) | **2.1** |
| 7 | IB5 | Poor Technical Skills of Contractor | (Cont) | **2.0** |
| 8 | IB1 | Construction Defects | (Cont) | **2.0** |
| 9 | IB8 | Contractors Poor Management | (Cont) | **1.9** |
| 10 | IB39 | Big difference bet original/actual quantities | (Cns) | **1.8** |
| 11 | CA5 | Work Stoppage by Owner | (Own) | **1.7** |
| 12 | IB13 | Delay in Drawings Approval | (Cns) | **1.7** |
| | | Highest 12 claim causes | | **24.4** |

**Table (6-12) The highest 12 claim causes with respective weights in medium size projects (worth 5-20 million Riyals)**

It is obvious from the previous table that (42%) of the claims are caused by owners, ranking as numbers one, two, five, six and eleven. These claim causes are untimely payment of varation orders, delayed payment by owner, untimely varation orders, owner initiated work stoppage and timing of variation orders. Contractors are the cause of 25% of the twelve highest claim causes. These ranked seventh, eighth and ninth. These claims were built on poor technical staff of contractor, construction defects by contractor, and poor management by contractor. Consultants were the cause of only one claim cause, which ranked as the last of the twelve highest claim causes in this medium sized category of projects. This was the claim on delay in approval of schedules. This amounted to 8.3%. The remaining claim causes were either caused by all of the parties or none of them. Those caused by all of the parties are claims on

variation order pricing and disputes on reimbursment of owner – caused delays. These made up 16.7%.

It is clear that contractors working in this category of medium sized projects are of a better technical quality than those working on smaller sized projects. Claim causes by contractors did not rank on top of the table and they only accounted for 25% of the total claim causes, an obvious contrast from the table on small sized projects. In another contrast, owners accounted for 42% of the claim causes and they ranked high in the table. The **impact** of owners in this category of medium sized projects is felt more than that in small sized projects. Consultants only accounted for 8% of the causes and ranked last out of twelve, which might be due to that better consultants are hired for this category of medium sized projects, in contrast to small sized projects where there might be underpaid consultants or some times no consultants at all. See Fig (6-8) below.

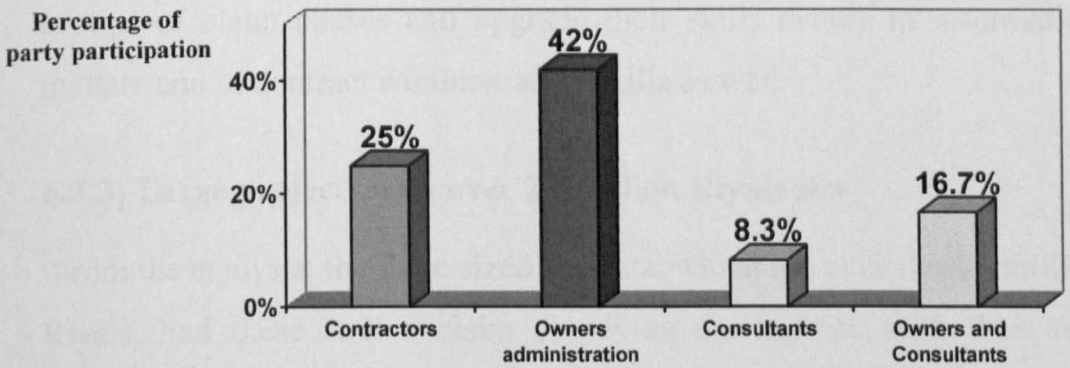



**Fig (6-8) Parties' participation in claim causes in medium projects**

**'Information based'** claims accounted for 50% of the claim causes, while **'contract administration based'** claims accounted for the balance (50%). No other claim causes from other groups appeared in the table. See Fig (6-9) below.

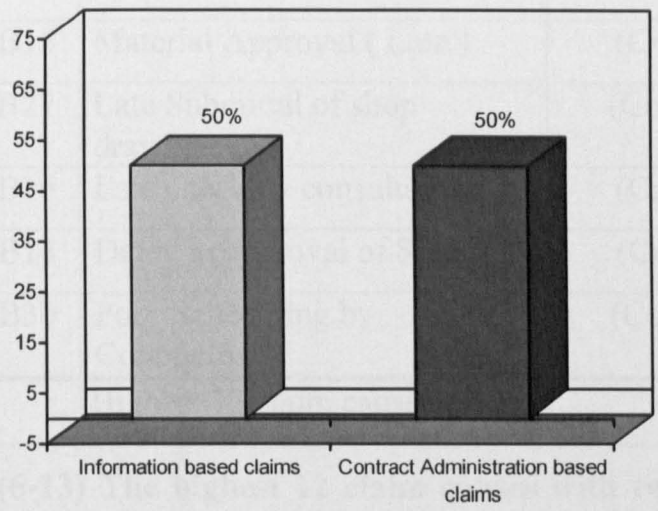



**Fig (6-9) Percentage of claim groups in the highest 12 claim causes in medium sized projects (5-20 Million S.Riyals)**

This might indicate that parties to a project must concentrate on these two groups of claim causes and upgrade their skills evenly in information-based matters and in contract administration skills as well.

### 6.3.3) Large projects with over 20 Million Riyals size

From the analysis, the large sized projects, which are over twenty million Saudi Riyals, had these twelve claim causes as the highest, with their respective weights, as follows:

| Rank | Code | Highest 12 Claims | Caused by | Weight |
|---|---|---|---|---|
| 1 | CA2 | Late Payments | (Own) | **3.6** |
| 2 | IB8 | Contractors Poor Management | (Cont) | **2.6** |
| 3 | 1B11 | Variation order pricing | (All) | **2.4** |
| 4 | IB1 | Construction Defects | (Cont) | **2.3** |
| 5 | CA8 | Disputed time Extension | (All) | **2.1** |
| 6 | CA10 | Variation order timing | (Own) | **2.1** |

| | | | | |
|---|---|---|---|---|
| 7 | IB13 | Delayed Drawings Approval | (Cns) | **2.1** |
| 8 | IB15 | Material Approval ( Late ) | (Cns) | **2.0** |
| 9 | IB27 | Late Submittal of shop drawings | (Cont) | **1.9** |
| 10 | IB16 | Late check by consultant | (Cns) | **1.8** |
| 11 | IB14 | Delay in approval of Schedule | (Cns) | **1.8** |
| 12 | IB30 | Poor Scheduling by Contractor | (Cont) | **1.8** |
| | | Highest 12 claim causes | | **26.5** |

**Table (6-13) The highest 12 claim causes with respective weights in projects over 20 million Riyals.**

It is obvious from the previous table that owners accounted for (17%) of all claim causes, ranking number one with late payments on top of all claim causes in this category of large projects. The other claim caused by owners ranked number six in the table and was on disputes over timing of variation orders. Contractors accounted for 33% of all twelve claim causes ranking as numbers two, four, nine and twelve. These claims were: poor management by contractor, construction defects, late submittal of shop drawings and poor submittal of schedules. Consultants accounted for 33% of the twelve claim causes as well, ranking as numbers seven, eight, ten and eleven. These claim causes were: delay in approval of shop drawings, delay in approval of materials, late approval of work done and delay in approval of schedules. Claims attributable to all parties accounted for 17% of the twelve highest claim causes. These were: disputes over variation order pricing and disputes over reasonable time extension. From the above discussion we can see that contractors account for 33% of the claim causes that rank second and fourth in the table (among others) with poor management and construction defects still a major cause of claim. Consultants account for 33% of the claim causes as well, yet they ranked low in the table, which suggests that a higher quality consultant is hired in these

large projects. Owners' role here is less than in the smaller projects, although the major claim cause is still that of delayed payment. See Fig (6-9) below.

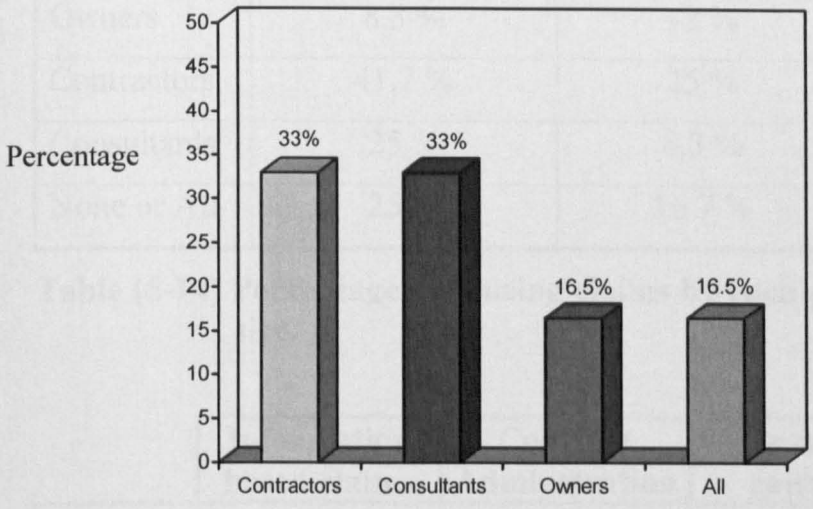



**Fig (6-10) Parties participation in claims causes in large projects (over 20 Million S.R)**

**'Information based'** causes of claims accounted for 75% of the twelve highest causes in this category of large projects while **'contract administration'** causes of claims accounted for 25% only which suggests that larger projects need more attention in information based matters so as to improve the flow of information between the parties to a project and to minimize the claims arising out of this category of claims. Contract administration skills should be upgraded as well to control claims arising from this category. See Fig (6-10) below.

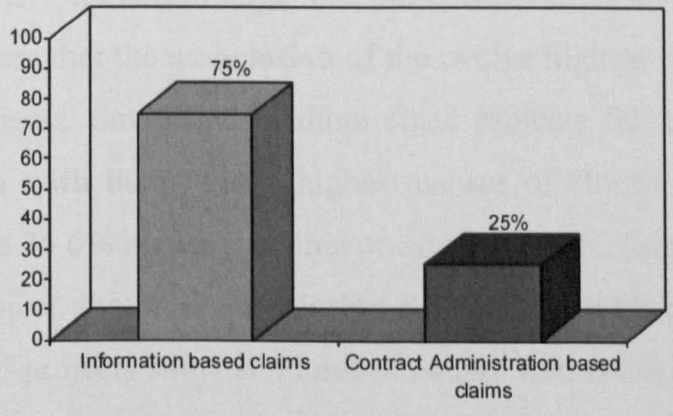



**Fig (6-11) Percentage of claim groups in the highest 12 claim causes in large projects (over 20 Million S.R)**

| | Small Projects | Medium Projects | Large Projects |
|---|---|---|---|
| Owners | 8.3 % | 42 % | 17 % |
| Contractors | 41.7 % | 25 % | 33 % |
| Consultants | 25 % | 8.3 % | 33 % |
| None or All | 25 % | 16.7 % | 17 % |

**Table (6-14) Percentage of causing claims by each party in relation to size.**

| | **Information based claims** | **Contract Adminstration** | **Man made causes** | **Site Conditions** |
|---|---|---|---|---|
| **Small** | 67 % | 17 % | 8 % | 8 % |
| **Medium** | 50 % | 50 % | — | — |
| **Large** | 75 % | 25 % | — | — |

**Table (6-15) Percentage of claims in each claim group in relation to size.**

### 6.3.4) General overview

The overall weight of **association** of the twelve highest claim causes in small projects (under 5 million riyals) was 23.8, in medium sized projects (5-20 million Riyals) was 24.4 and in large size projects (over 20 million Riyals) was 29.9. It is clear here that the **association** of the twelve highest claims was larger in large size projects. Small and medium sized projects felt more or less the same **association with** their twelve highest causes of claims. The **impact** on large projects was 25.6% higher than that on small projects. It is shown here that the larger the project, the more **association** it will incur **with** causes of claims. The three sizes of projects showed a total of twenty five claim causes and three of these were common between two categories and four of them were common between the three sizes. These claims that were shared by the three sizes were:

construction defects by contractors, poor management by contractors, delayed payments, and disputes over pricing of variation orders. Construction defects rated higher in small projects with a weight of 2.6, then in large projects with a similar weight of (2.6) and last in medium size projects with a weight of (2). This claim cause ranked second out of twelve in small projects, fourth in large ones and eighth in medium sized ones. Poor management by contractor cause of claim had an **association** higher on large projects (2.9) and ranked second out of twelve. It had a weight of **association** of (2.2) in small projects and ranked fourth. Its weight in medium sized projects was (1.9) and ranked ninth. It is clear here that management concerns are higher in large projects followed by small and medium ones. Large projects need high management skills, but it seems that this size of projects does not have enough contractors with these skills, and this is an area where contractors have to improve. Delayed payments by owners had the largest **association** of (3.6) in large projects, and ranked first out of twelve. It ranked second in medium sized projects with a weight of (2.4) and sixth in small project with an **a weight of association** of (2.2). It is clear here that the **association with** delayed payments increases with the increase in the project size. The **association with** large projects was 63% more than that on small ones. Disputes over pricing of variation orders ranked third out of twelve in both large and medium sized projects with a weight of (2.4) in large projects and (2.1) in medium sized ones. It ranked seventh in small projects and had an **association** of (1.9). It is clear here that the **association with** this claim cause grows with the increase of the size of the project. The **impact** on the large projects was almost 30% more than that on small ones. The claim cause of poor technical staff of the contractor was common between small and medium sized projects. It ranked first out of twelve in small projects with a weight of **association** of (3.9) and ranked seventh in medium sized projects with an **a weight of association** of (2). It seems that the **effect** of this claim cause is inversely proportionate to the size of the project i.e the smaller the project, the larger the **association** will be. This claim cause was not shown in the twelve highest in large projects. The dispute

over timing of variation orders is shared between medium and large projects. It ranked fifth in medium sized projects with a weight of **association** of (2.1) and ranked sixth in large projects with a weight of **association** of (2.2). This claim had a weight of only (0,9) in small projects. It is clear that the **effect** of this claim is directly proportionate to the size of the project. i.e. the larger the project, the more **weight of association** there will be with it due to the dispute over variation order timing. The amount of money and time needed to cope with late variation orders increases as the size of the project increases. This would increase the risk and as a result will increase the **effect** on the project. The claim cause of delay in approval of drawings is shared by large and medium sized projects. It ranked seventh in large projects with a weight of **association** of (2.1) and ranked twelvth in medium sized projects with a weight of (1.7). It only had a weight of **association** of (0.9) in small projects. This shows that the larger the size of a project the more **weight of association** there will be due to delay in approval of drawings. Taking in consideration that small projects have the minimum of contract drawings and almost have no shopdrawings made by contractors, and to the contrary, large projects have to have shopdrawings made by contractors, we can notice how the delay in approving shopdrawings can have a larger **association with** larger projects. The total **weight of association** of the twenty five causes of claims in the next table in the large projects sector was (49.6), for the medium sized was (40.1) and for the small sized was (34.1), which again strengthens the result that was found earlier that the **weight of association with** the project rises with the increase in the size of the project. Small projects had five claim causes in common with the medium sized, or with both medium and large sizes. Medium projects had seven claim causes out of twelve in common with either small or large projects, or in common with both of them. Large projects had six claim causes in common with the medium sized projects, or with both medium and small sized projects. Contractors were the cause in 33% of the cases. They were the cause of 41% of claims in small projects with a weight of (11.6), 25% in medium sized projects with a weight of

(5.9) and 33% in large projects, with a weight of (9.6) Owners were the cause in 17% of the cases. They were the cause of 8% of claims in small projects with a weight of (2), 33% in medium size projects with a weight of (8.7) and 8% in large projects, with a weight of (4). Consultants were the cause in 25% of the cases. They were the cause of 25% of claims in small projects, with a weight of (5.8), 17% in medium size projects with a weight of (3.6) and 33% in large projects with a weight of (8.8). All the parties (or any one of them) were the cause in 19% of the cases. They were the cause of 8% of claims in small projects with a weight of (1.7), 25% in medium sized projects with a weight of (6.4) and 25% in larger projects with a weight of (7.5). None of the parties were the cause in 5% of the cases, and were the cause of 17% of claims in small projects with a weight of (2.7) and were not a cause in either medium or large size projects.

The following table shows the results discussed above

| | Small Projects | Medium Projects | Large Projects | Total |
|---|---|---|---|---|
| **Owners** | 2.0 | 8.7 | 4.0 | 14.7 |
| **Consultants** | 5.8 | 3.6 | 8.8 | 18.1 |
| **Contractors** | 11.6 | 5.9 | 9.6 | 27.1 |
| **All** | 1.7 | 6.4 | 7.5 | 15.5 |
| **None** | 2.7 | - | - | 2.7 |
| **Total of highest 12 claims causes** | 23.8 | 24.4 | 29.9 | |
| **Total of all 25 claim causes** | 34.1 | 40.1 | 49.6 | |

**Table (6-16)Weights of association by parties to a project with different sizes of projects.**

The information from table (6-16) is plotted in Fig (6-11) below.

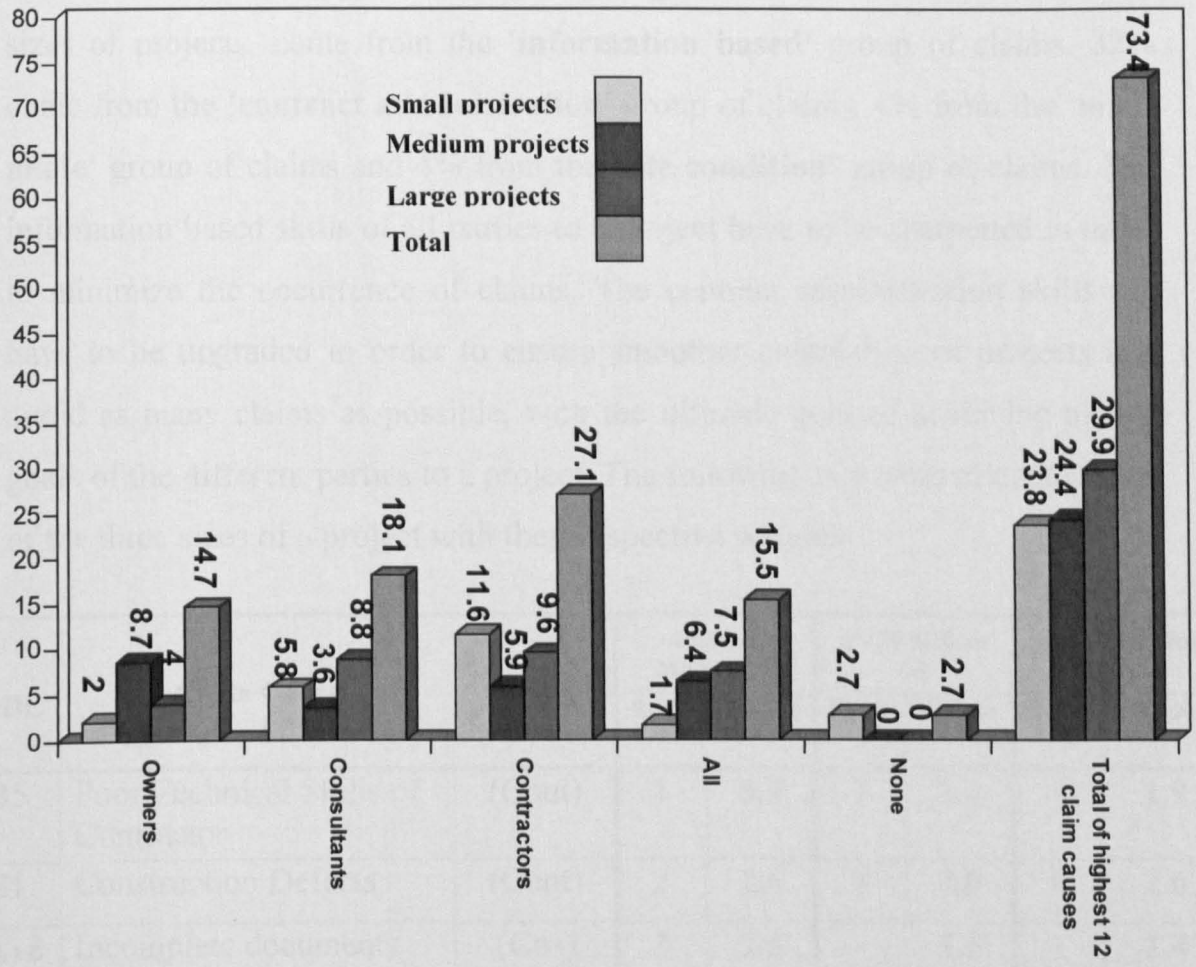



**Fig (6-12)Weights of association by parties to a project with different sizes of projects.**

It is clear from the above table that contractors have the largest **effect** followed by consultants and owners. In small projects contractors are the ones with the largest **impact**, in medium projects owners have the largest **impact** and in large projects contractors followed by consultants have the largest **impact**. It is because contractors are the ones who perform the work that they feel the largest **effect**, especially on small and large projects. Owners seem to have a strong grip on medium sized projects that made them have a big **impact** in this category of projects. The strongest **effect** of consultants is noticed in large projects, and this could be due to that the larger the project the more consultant

participation it needs. Back to the general view, we notice that 60% of twenty five claim causes that appear in the twelve highest causes of claims for the three sizes of projects, come from the **'information based'** group of claims. 32% come from the **'contract administration'** group of claims, 4% from the **'man-made'** group of claims and 4% from the **'site condition'** group of claims. The information based skills of all parties to a project have to be sharpened in order to minimize the occurrence of claims. The contract administration skills too have to be upgraded in order to ensure smoother completion of projects and avoid as many claims as possible, with the ultimate goal of achieving all the goals of the different parties to a project. The following is a table of comparison of the three sizes of a project with their respective weights.

| CODE | Claim Cause | Caused by | Under 5 Million SR | | 5 – 20 Million SR | | Over 20Million SR | |
|---|---|---|---|---|---|---|---|---|
| | | | Rank | Weight | Rank | Weight | Rank | Weight |
| IB5 | Poor Technical Skills of Contractor | (Cont) | 1 | 3.5 | 7 | 2.0 | - | 1.9 |
| IB1 | Construction Defects | (Cont) | 2 | 2.6 | 8 | 2.0 | 4 | 2.6 |
| CA18 | Incomplete documents | (Cns) | 3 | 2.5 | - | 1.6 | - | 1.4 |
| IB8 | Contractors Poor Management | (Cont) | 4 | 2.2 | 9 | 1.9 | 2 | 2.9 |
| IB24 | Incomplete Specs | (Cns) | 5 | 2.0 | - | 1.5 | - | 1.1 |
| CA2 | Late Payments | (Own) | 6 | 2.2 | 2 | 2.4 | 1 | 3.6 |
| 1B3 | Poor workmanship | (Cont) | 7 | 1.7 | - | 1.0 | - | 1.5 |
| 1B11 | Variation order pricing | (All) | 8 | 1.7 | 3 | 2.1 | 3 | 2.7 |
| IB10 | Low Bidding | (Cont) | 9 | 1.6 | - | 1.4 | - | 1.9 |
| Mm | Force majeure (war) | (None) | 10 | 1.4 | - | 0.7 | - | 1.6 |
| IB37 | Incomplete Drawings | (Cns) | 11 | 1.3 | - | 1.7 | - | 1.8 |
| Sc2 | Subsurface Conditions | (None) | 12 | 1.3 | - | 1.4 | - | 1.6 |
| CA12 | Variations too many | (Own) | - | 0.5 | 1 | 2.5 | - | 1.8 |
| CA6 | Disputed Compensations | (All) | - | 0.9 | 4 | 2.1 | - | 1.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA10 | Variation order timing | (Own) | - | **0.9** | **5** | **2.1** | **6** | **2.4** |
| CA11 | Variations Payment | (Own) | - | **0.8** | **6** | **2.1** | - | **1.8** |
| IB37 | Incomplete Drawings | (Cns) | - | **0.5** | **10** | **1.8** | - | **1.6** |
| CA5 | Work Stoppage by Owner | (Cns) | - | **1.0** | **11** | **1.7** | - | **0.6** |
| IB13 | Drawings Approval | (Cns) | - | **0.9** | **12** | **1.7** | **7** | **2.4** |
| CA8 | Disputed time Extension | (All) | - | **1.1** | - | **1.6** | **5** | **2.4** |
| IB15 | Material Approval | (Cns) | - | **0.7** | - | **1.3** | **8** | **2.8** |
| IB27 | Late Submittal of shop drawings | (Cont) | - | **0.7** | - | **0.9** | **9** | **2.1** |
| IB16 | Late check by consultant | (Cns) | - | **0.8** | - | **1.1** | **10** | **2.1** |
| IB14 | Delay in approval of Schedule | (Cns) | - | **0.7** | - | **0.6** | **11** | **2.0** |
| IB30 | Poor Scheduling by Contractor | (Cont) | - | **0.8** | - | **0.9** | **12** | **2.0** |
| | Weights of the Highest twelve claim causes | | - | **23.8** | - | **24.4** | - | **29.9** |
| | Weights of the 25 claim causes | | - | **34.1** | - | **40.1** | - | **49.6** |

**Table (6-17) A comparison of claim causes and their respective weights of the three sizes of projects.**

From the above table (6-17) the 12 highest claim causes in relation to size can be plotted as in fig (6-12) below

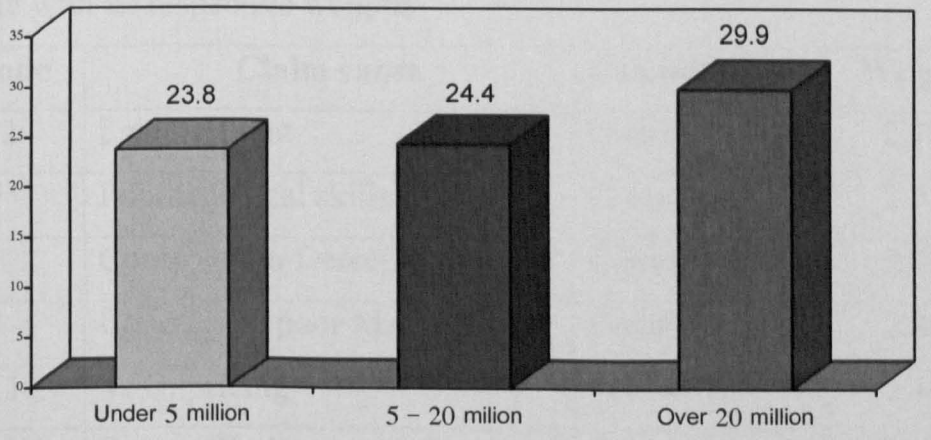



**Fig (6-13) Weights of the highest 12 claim causes in relation to size**

From the above table (6-17) the total weights of the 25 claim causes ranking as the highest 12 can be plotted as in fig (6-13) below

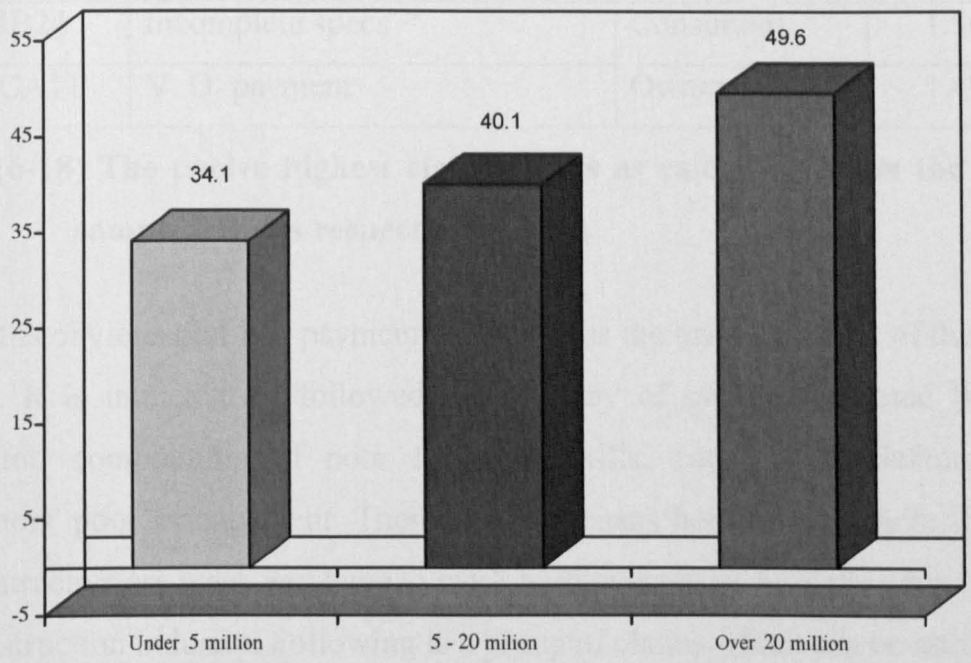



**Fig (6-14) Weights of the 25 claim causes ranking as the highest 12 between the three sizes of projects**

## 6.4) Discussion of the 12 highest claim causes on the total sample:

The following list shows the twelve highest claim causes as calculated from the total sample with its respective weights

| | Code | Claim cause | Caused by | Weight |
|---|---|---|---|---|
| 1 | CA2 | Late payment | Owner | 2.78 |
| 2 | IB5 | Poor technical skills | Contractor | 2.53 |
| 3 | IB1 | Construction Defects | Contractor | 2.44 |
| 4 | IB8 | Contractors poor Management | Contractor | 2.40 |
| 5 | IB11 | V. O. pricing | All/Owner | 2.14 |
| 6 | CA5 | Owner Work stoppage | Owner | 1.76 |

| | | | | |
|---|---|---|---|---|
| 7 | CA10 | V. O. timing | Owner | 1.75 |
| 8 | CA8 | Disputed time extension | Owner | 1.67 |
| 9 | IB13 | Late drawing approval | Consultant | 1.66 |
| 10 | IB10 | Low bidding | Contractor | 1.65 |
| 11 | IB24 | Incomplete specs | Consultant | 1.56 |
| 12 | CA11 | V. O. payment | Owner | 1.49 |

**Table (6-18) The twelve highest claim causes as calculated from the total sample with its respective weights**

It is obvious that late payment by owners is the prime concern of the total sample. It is immediately followed by an array of problems caused by the contractor, complaining of poor technical skills, construction defects and contractors' poor management. There is a consensus here by the whole sample that contractors are weak and have to work hard to catch up with the advances in the construction industry. Following is a group of claims which can be attributed to owners starting with variation order pricing, which can be jointly the responsibility of the owner and the other parties. Then come three claim causes which are caused by owners and those are owner inflicted work stoppage, variation order timing and disputed time extensions. Following these come four claim causes that are attributable to the three parties individually and those are late drawing approval by consultants, low bidding by contractors, incomplete specifications by consultants and the late payment of variation orders by owners. Owners were the cause of 50% of the twelve highest claim causes of the total sample, while contractors were the cause of 33% of the claims and consultants accounted for 17% of the total. This could be due to the fact that the majority of respondents to the questionnaire were consultants, thus not seeing themselves as a major cause of claims. 58% of the claim causes come from the **'information'** category of claims while 42% come from the **'contract administration'** category of claims. This nearly even split between the two categories shows the

importance of correction of the management of the three parties to the project in the field of information and contract management.

## 6.5) Summary

It was shown that each of the three parties of a project blames the other two parties of being the main cause of their claims. The **weight of association** of claims was almost equally felt by the three parties, with consultants feeling a little more than the other two (owners and contractors). The causes of claims were common in a few cases but their was no consensus on the majority of claim causes. Contractors were the main cause of claims in government projects while consultants were the main cause of claims in private ones. The 'information-based' group of claims was the main source of claims in government projects, while in private project the claims' sources were evenly split between the latter and the ' contract administration ' group. Contractors were the main initiators of claims in small sized projects, while owners were the main cause of claims in medium sized projects. Both contractors and consultants were the highest cause of claims in large sized projects. It was shown that the larger the project, the more the **effect** of claims was felt. The most affected of the six claim groups was that of 'information', followed by that on 'contract-administration'.

## Chapter (7)

## Discussion of the Hypothesis

### Introduction

This chapter will discuss the acceptance or rejection of the six general hypotheses that were formulated earlier in chapter 3 on the methodology of research. The party to the project (owner, consultant, and contractor) will be discussed to show whether any of them will have an influence on a claim. Furthermore, the ownership type of the project (government or private) is also discussed on whether it will influence a claim in a project, and whether the size of a project will have any influence on claims arising in a project. The second part of the chapter discusses the influence of the party to a project, the ownership type and the size of the project on the eight dependent variables outlined in this research (***time***, ***money***, ***quality***, ***function***, ***life expectancy***, ***operation***, ***reputation*** and ***future relationship*** of the parties).

### Identifying strong influences

To sort strong from weak influences the following steps were taken.

1- Counting of frequencies of claim association in each variable cell (variables are ***time*** , ***money***, ***operation***, ***quality***, ***function***, ***life expectancy***, ***reputation*** and ***future relations***) in the frequency distribution tables and the normalised weights tables (Appendix B) at the end of this thesis.

2- The frequency readings were plotted at 0.5 intervals and an average was calculated of these intervals, and a line of weak/strong border was drawn vertically Figs (66-74 in Appendix C).

3- Only frequencies on the strong side were considered and shaded in

the normalised weights of associations tables (Appendix B) and shown as strong associations on the eight variables.

4- The number of strong associations cells was counted in each claim group and divided by the number of questions in each group. The average was calculated and whatever group ranked above that average was considered as having a strong association.

5- A diagram was plotted for each category of research (party to a project, ownership and size of a project) Figs (75-83 in Appendix D).

The chi-squared statistical calculations that were made to either support or reject the hypothesis are to be found in (Appendix A) at the end of this thesis. All the possible scenarios of relationships are discussed in this chapter, some have been statistically accepted and some rejected. These relationships between a variable causing a claim, an actor (party to a project) and the association of the claim are all discussed in detail. From this linkage a great number of consequences flow: some will materialize, some will not.

| Variable | Actor | Out comes of Related Issues | Weight of associations | Total |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | Total | | | |

The following is a table with the results of acceptance of the six general hypotheses

| | | Accepted | Rejected |
|---|---|---|---|
| $H_1$ | Type of the party to a project does not influence the type of claim | ✓ | |
| $H_2$ | There is no difference between the type of claims submitted in Gov. or private projects | ✓ | |
| $H_3$ | The size of the project has no influence on the type of claim | ✓ | |
| $H_4$ | The project party has no influence on the association on the eight variables | | ✓ |
| $H_5$ | Type of ownership (Gov./Priv.) does not influence the eight variables | | ✓ |
| $H_6$ | The size of a project has no influence on the eight variables | | ✓ |

Sample Discussion of the results of the acceptance of the six general hypothesise

### 7.1) H1 : The type of the party to a project does not influence the type of claim.

This hypothesis was supported by the results of the analysis made by the chi-square test and the proportion test and by the weighed associations. The three parties to a project that were mentioned in the questionnaire were the owners, the contractors and the consultants. If we take the owners, first we can see that four out of six sub hypothesis concerning their influence on the type of claim were supported by the results of the analysis done. It was seen that owners did not influence the Acts of God claims. This is due to that these claims would usually be initiated by contractors, or that these Acts of God are rare and have no

great influence over the construction industry. It was also seen that owners did not influence the man-made claims. Such claims in this group like war, strikes, fire, pollution, and change in legislation are all factors that will generally affect the contractor. These claim causes are not usual in the Saudi construction industry. The site conditions group of claims was also seen as owners not having influence on them. This group of claims contains such claim causes as limited access to the site, unpredictable sub surface conditions, historical ruins or cemetery found on site and disputed site ownership. The government as owner usually puts the burden of site investigation on the contractor who is obliged to make the necessary foundation at the cost mentioned in the contract, whatever the kind of soil turns to be or whatever type of foundations the consultant might suggest to suit soil conditions. It seems there are not a lot of historical ruins in construction sites in Saudi Arabia, nor are there much disputes of site ownership. It was also seen that market driven causes of claims were not influenced by owners. This group contains claims on inflation of costs, currency fluctuations and shortage of basic resources or services. These claims are usually initiated by contractors and not owners. These claims are not common in Saudi Arabia where currency fluctuation is rare and the inflation is usually under strict government control. The shortage of basic resources or services is also rare and only happened countrywide during the Gulf War in 1991.

### 7.1.1) Owners

Although the hypothesis that the type of party to a project does not influence the type of claim was supported by the tests done, yet the sub hypothesis that these parties do not influence the type of claim in the contract administration and the information-based groups was rejected.

This rejection of the two groups of claims was not enough to make the main hypothesis rejected as well. Therefore, owners do influence the contract administration group of claims. This group contains claims such as poor coordination between contractors, which is mainly the main contractor's job, unless the owner himself is managing several sub-contractors in his project. Other claims are delayed payments by owners which is obviously influenced by owners. The claim caused by delayed hand over of site to the contractor will be due to the owner's actions or omissions and thus influenced by him. The three claims of owner-caused work stoppage, dispute on reimbursement of owner-caused delay and dispute on reimbursement due to owner-directed acceleration will all be influenced by the owner, who will push the contractor to claim against him due to his (owner's) actions. The claim on the dispute on reasonable time extension will be influenced by the owner as well. Owners would rarely grant extensions of ***time***, even if they were the cause of delay. Very few owners will admit that the delay was caused by them. Some owners will not grant the contractor an extension of ***time*** due to owner-caused delays, but will rather order an acceleration in order to finish the project on time, if the handing over date was non negotiable. The claim on disputed market value of variation orders will be influenced by owners when they are not willing to compensate the contractor fairly on variation orders ordered by owners. The claim on untimely given variation orders is also influenced by owners who sometimes make either necessary or unnecessary changes to their projects in the final stages of the project, which result in contractors claiming ***money*** and ***time*** to deal with such variation orders. Some owners will not agree to fair compensation, thus forcing contractors to claim for remedy. The claim on variation orders not paid on time will also be influenced by owners as they do with late payments. Some owners will delay payment of variation orders in order

to put the contractor under pressure and might ask him to negotiate a discount on the pending amount. The claim on too many variation orders will be influenced by an owner who has not sufficiently studied his needs of the project, or who does not respect the project documents and gives too many variation orders. This will also happen if the owner has changed the site of the project after getting into contract with a contractor, or has changed the ***function*** of the building during construction time. In both cases, this shows that the owner has not put enough effort at the preliminary stages of the study of the project. The claim on the consultant being uncooperative will be influenced by an owner who does not monitor the performance of his consultant, or who is underpaying him, or is delaying his payments. He will also have chosen an unqualified consultant, which is the case with some consultants in Saudi Arabia. Whatever the cause could be, it is the owner to blame here and it is he who will influence the initiation of such claims by the contractor. The claim on poor documentation will partly be influenced by the owner if his team is not performing according to the usual norms of the trade, or if his consultant is not keeping the documents as he should and the owner is not monitoring his consultant's performance. The claim on the contract that does not specify the dispute resolution method will be influenced by an owner who did not bother early enough to prepare a balanced contract, or did not choose the right consultant or lawyer to draft the necessary contract. Contract forms are rarely used in the private sector in Saudi Arabia, so such claims are not uncommon. The claim on poor contract documents that could be ambiguous, contradicting, or incomplete will be influenced by owners who did not allow enough time for the team preparing such documents, or did not properly compensate the team. Uneducated owners who deal poorly with their projects could be found in the private sector. The claim that the project specified ***time*** is not

sufficient for the work will be influenced by owners who in their search for quick completion will specify short periods to complete the project. ***Time*** overruns in projects in Saudi Arabia are not uncommon. The claim on nominated sub-contractors will also be influenced by owners who will force their contractors to accept unqualified nominated sub-contractors who would cause problems to the project and to the main contractor. The technical and information-based group of claims contains such claims as construction defects, poor workmanship/ ***quality*** of work and poor materials used or supplied by contractor. Some owners will influence such claims by choosing the wrong contractor to do the job. The selection technique of the lowest bidder will add to the problem. An owner will also influence such claims by appointing the wrong consultant to supervise the work. The claim on poor skills of the technical staff of owner, contractor, or consultant will also be influenced by the owner. It is obvious he is to blame for the poor skills of his own staff. He is also to blame for the poor skills of his selection of the consultant, not monitoring his performance, or not paying him the sufficient fees. The claim on the project being under priced will be influenced by the owner who resorts to the lowest bidder procurement method or chooses the wrong contractor, either by direct negotiation or through primitive selection techniques that do not put weight to the technical and managerial strengths of a contractor. The claim on disputes over cost of items deleted or added to the bills of quantities will be influenced by owners if they do not wish to be fair to contractors. Taking a hard position on such issues could mean good entrepreneurship to some uneducated owners. The claim on delay in approval of either drawings, schedules, materials, work performed, measured quantities, or tests will also be influenced by owners who either choose the wrong consultant, under pay him, on not monitor his performance. The same applies to the claim on specifications being

unclear, contradictory, or incomplete. Another influence here by the owner is when he does not provide sufficient time to his consultant to perform the work in the traditional way of designing – bidding and construction. The fast track method could be applied for tight scheduled projects with no compromise on ***quality***. The claim on delay in submittal of drawings by owner, consultant or contractor will as well be influenced by the owner. If he or his consultant were late in submitting the drawings to the contractor, then they will be influencing this claim. The claim on poor submittals by contractor of shop drawings, as built drawing or of schedules will be influenced by owners as discussed above in their role of choosing the wrong contractor. The claim on the original design being incompatible with local conditions, the capacity of local contractors, suppliers/ or manufacturers will also be influenced by an owner who chose a foreign consultant that has no knowledge of the local conditions and capabilities or the local construction industry. This could have happened during the construction boom in Saudi Arabia in the seventies and eighties of the twentieth century, when there was a shortage of good consultants. Owners who wanted to construct large projects used the services of international consultants who sometimes designed projects that needed great changes when under construction to fit the standards of the local contractors, suppliers or manufacturers. The claim on design drawings being incomplete, contradictory or have errors will also be influenced by owners. The previous discussion on owners' role in choosing the wrong contractor is applicable here in relation to choosing the wrong consultant, underpaying him, or not giving him the sufficient time to do the work. The claim on great differences between original and actual quantities will also be influenced by owners. Dealing in an unprofessional manner with projects will lead to such claims. The previous discussion on owners' responsibility of choosing the wrong

contractor or consultant or not giving the consultant the sufficient time for the job is applicable here too.

### 7.1.2) Contractors

In discussing the contractor as a party to a project, we find from the analysis that he does not influence the type of claim in the project. The null hypothesis was accepted here. Going back to the data, we find that contractors did not influence four of the group claims namely 'Acts of God' claims, man-made claims, site condition claims and market-driven claims. The data show that contractors do influence two of the claim groups, namely 'contract-administration' claims and 'technical and information-based' claims. The last two groups were not enough to reject the main hypothesis and it was accepted that contractors do not influence the type of claim. It was noticed from the data that contractors did not influence 'Acts of God' claims. This will be due to that these claims come from third parties and are not due to any party's actions or omissions. Contractors only react to 'Acts of God' claims, which contain such claims on earthquakes, typhoons, inclement weather and floods. Such claims are rare in the Saudi construction industry as these incidents are very few. It was also noticed from the data that contractors did not influence man-made claims, which contain such claims as war, strikes, fire, pollution and change in legislation. Here also we can see that contractors are only reacting in their claims to third parties' actions, and that they are not influencing these claims. Claims built on man-made causes are not widespread in Saudi Arabia and the only ***time*** contractors submitted claims built on the cause of war was in the early nineties after the second Gulf War. The 'site conditions' group of claims was also seen from the data analysis that contractors did not have influence on them. The claim on limited access to the site would be a reaction to the owner's or a third

party's actions, and the contractors would not influence this claim. The claim on unpredictable subsurface conditions will be influenced by incomplete information from either the owner or the consultant. The same will be applicable to claims on historical ruins found on site or a cemetery. These will be due to incomplete investigations undertaken by the owner or the consultant and not fully influenced by the contractor. The claim on disputed site ownership will also not be influenced by the contractor, who will only react to problems initiated by third parties. The market-driven group of claims was also seen from the data analysis that contractors did not have influence on them. The claim on inflation of costs or currency fluctuation is imposed on the contractor by the general environment of the country and is not influenced by the contractor himself. The claim built on shortage of basic resources or services is also due to the effects of the industry and country environments and not influenced by the contractor. The contractor here just reacts to the environment's actions and moves. These claims are not common in Saudi Arabia, and only during the second Gulf War did contractors claim for compensation due to shortages of resources. From the data analysis, we see that contractors do influence the contract administration group of claims in the sub hypothesis, although the main hypothesis that the parties to a project do not influence the type of claim was accepted. Claims built on poor coordination between contractors will be influenced by contractors, who as main contractors might not professionally coordinate between the subcontractors' activities. Claims on delayed payment by owners will not be influenced by contractors. Claims on delayed hand over of site to contractor usually will not be influenced by the contractor unless this contractor asks for such hand-over to be postponed if he were not ready for it. The claim on stoppage of work by owner will be influenced be the contractor when this stoppage is due to any breach of

contract by the contractor. The claim on disputed reimbursement of owner-caused delay will be influenced by the contractor if he is asking too much compensation or is not cooperating with the other parties in negotiating this matter. The same applies to the claim on dispute on reimbursement due to owner-directed acceleration. The contractor will not be technically able to discuss such topics of ***time*** and cost in a professional way to satisfy the owner or the consultant. The same applies to the claim on disputed reasonable ***time*** extension when a contractor will influence this claim by claiming too long a ***time*** extension or does not have the necessary tools to discuss and convince his counterparts. Again, the same applies to claims on the reasonable market value of variation orders. If the contractor asks too much and cannot convince the owner or consultant with his figures or claim, this contractor will be influencing such a claim. The claim on variation orders given untimely are mostly not influenced by contractors. A contractor will influence such a claim if he were required, as per contract, to review the design drawings and specifications to report on any mistakes, and he failed to do that in a timely manner, which resulted in the owner having to issue untimely variation orders. The claim on variation orders not paid on time will usually not be influenced by the contractor unless he did not satisfy the owner or consultant by presenting the necessary documents and calculations to support his claim for a variation order. The claim on variation orders being too many will not usually be influenced by the contractor unless as previously discussed he did not perform his obligation of reviewing the contract documents in a satisfactory manner. The claim on the consultant being uncooperative will not usually be influenced by the contractor unless in cases where this negative attitude of the consultant is a reaction to the contractors actions or omissions. The claim on poor documentation will be influenced by the contractor if his

administrative capabilities are not up to the standard of the project. Poor documentation will put the contractor in a weak position when he needs to claim anything from the owner. The weapon of good documentation is greatly undervalued by most contractors in Saudi Arabia. The claim on that the contract does not specify the necessary dispute resolution methods will be influenced by the contractor if this contractor did not point out to the owner at the beginning that such clauses are missing or if the contractor himself drafted the contract, which is a common practice in Saudi Arabia in small private projects. The claim on contract documents being incomplete, ambiguous or contradictory will usually not be influenced by the contractor unless, as previously discussed he failed to notify the owner or the consultant of any shortages in the contract documents. The claim on the project specified ***time*** being insufficient for completion will be influenced by the contractor if he suggested such a ***time*** in his bid, usually to win the bid, or if he agreed at the beginning to sign a contract without professionally checking on the sufficiency of the project duration, or was eager to take the project and find ways to claim for ***time*** extensions later. The claim on nominated sub-contractor will be influenced by the contractor if he did not raise the issue of the nominated sub-contractor being not suitable for the project. If he does not raise the issue, or raised it but accepted the nominated sub-contractor when the owner insisted on him, this way he will be influencing this claim type.

### 7.1.3) Influence on the Information-Based Claim group

From the data analysis we see that contractors do influence the type of claim in the 'information-based' claim group. This sub-hypothesis and the one on contract-administration which also showed that contractors did influence the 'contract-administration' type of claims, these two sub-hypothesis were not enough within the six groups of claims to change the

main hypothesis that the party to a project does not influence the type of claim. The information-based group of claims has such claims as construction defects by contractor. Surely, a contractor will influence such a claim by his defective work on site. Claims on poor materials used or supplied by the contractor, poor workmanship and ***quality*** of work, and improper equipment used on site, are all claims that will be influenced by the contractor through his actions. Poor workmanship is widespread in construction sites in small projects in Saudi Arabia, and the previous chapter on the highest twelve claims showed that this claim on poor workmanship ranked high among the highest claim causes in Saudi Arabia. The claim on poor skills of the technical staff of the contractor will surely be influenced by the contractor who chooses unqualified and/or low paid staff and will no doubt suffer the consequences. The claim on poor skills of the technical staff of the owner or the consultant will not be influenced by the contractor, but the claim on poor management staff of the contractor will surely be influenced by the contractor. Poor management by the contractor is also one of the major claims in Saudi Arabia, as the discussion in a previous chapter showed. The claim on the project being under priced is surely influenced by the contractor, who, for the sake of winning the bid, will under price his bid to a dangerous limit. The contractor will also influence this claim by agreeing to negotiate his bid and giving some discount to the owner while lacking professional pricing and negotiation techniques. The contractor will also get into a contract knowing it is under priced but with the intention to claim later to make up for the deficit. The claim on disputes on the cost or percentage of items added or deleted will be influenced by the contractor if he asks for unreasonable prices for these items. In a contract on a lump sum basis and in the absence of bills of quantities, this problem will be evident. Not all projects on lump sum basis have bills of

quantities, in Saudi Arabia, leaving the door open for disputes on added or deleted work. The percentage of added or deleted work is also another problem in lump sum projects in Saudi Arabia where the contract clauses do not make quite clear the issue of what percentage of each item could be deleted or added, and weather the stated 10 or 15% that could be added or deleted from the contract sum can be made in one or more items. The claim on delay in approval of drawings, schedules, materials, work performed, measured quantities or tests will not be influenced by the contractor unless the delay is due to some fault of the contractor in the drawings he submitted or the materials, schedules or quantities he has submitted or tests he made. The claim on specifications being not clear, contradictory or incomplete will usually not be influenced by the contractor unless his obligations under the contract were to review these specifications and report any discrepancies to the owner. The claim on delay of submittal of drawings by the owner or consultant will surely not be influenced by the contractor, who will no doubt influence the claim on late submittal of drawings by the contractor himself. The claim on poor submittals by contractor of shop-drawings, as-built drawings or schedules will no doubt be influenced by the contractor. Such poor submittals are a sign of the poor technical standard of the contractor and the poor management standard as well. These two claim causes ranked high in the twelve highest claims discussed in a previous chapter. The claim on that original design is incompatible with local conditions and capability of local contractors /suppliers or manufacturers is not influenced by the contractor but rather by the owner and/or consultant. The claim on design drawings having errors, or are incomplete or contradictory is not usually influenced by the contractor unless he was asked to review the design drawings and point out the discrepancies. In the design-build type of procurement, the design drawings will be the responsibility of the

contractor, who will be in a joint venture with the designing firm. The last claim in this information-based claim group is the claim built on great differences between original and actual quantities. The contractor will not influence this claim in a unit rate contract, where it will be influenced by the consultant. In this type of contract, the contractor might be asked to verify the quantities by checking the drawings and site conditions. If he fails to do so, he will certainly influence such a claim. In a lump sum contract, quantities will usually be the responsibility of the contractor, who will surely influence such a claim under such a contract.

### 7.1.4) Consultants

In discussing the consultant as a party to a project, we find from the analysis of the data that he does not influence the type of claim in the project. The null hypothesis was accepted here. Going back to the data we find that consultants did not influence four out of six of the group claims, namely Acts of God claims, man-made claims, site-condition claims and market-driven claims. The data show that consultants do influence two of the claim groups, namely contract-administration claims and technical and information-based claims. The rejection of the last two sub-hypothesis was not enough to reject the main hypothesis, and it was accepted that consultants do not influence the type of claim. It was noticed from the data that consultants did not influence Acts of God claims. These claim causes are usually due to third parties and not due to any actions or omissions of the three main parties to a project. The claims in this group contain such claims as earthquakes, typhoons, inclement weather and floods. These claims are rare in Saudi Arabia and the party usually concerned with initiating such claims is the contractor, so it is clear here that consultants are not influencing this group of Acts of God claims. It was also noticed from the data that consultants do not influence

the man-made group of claims, which contains such claims as war, strikes, fire, pollution and change in legislation. These claims are usually initiated by contractors, and consultants do not have any influence on them. Such claims are not common in Saudi Arabia as has been observed previously from the data. The site condition claims group was also seen from the data analysis that consultants did not have influence on it. The claim on limited access to the site will be influenced by either the owner or by a third party (like the police or municipality) and the consultant will not influence this claim. The claim on unpredictable subsurface conditions will slightly be influenced by the consultant if he did not make the necessary investigation or gave wrong information to the contractor. It is usually the case in Saudi Arabia that contractors have to make their own and independent site investigations. This will put the burden of any future problems on the contractor. Consultants are not influential in such claims. The same argument will be applicable to claims on historical ruins found on site or a cemetery. The claim on disputed site ownership will also not be influenced by the consultant who will only react to problems initiated by third parties. The market driven group of claims was also seen, from the data analysis that consultants did not have influence on them. The claim on inflation of costs or currency fluctuation is due to the market dynamics of the country where the project is being constructed and so out of the hands of all parties. The claim on shortage of basic resources or services is also due to the effects of the industry and country environments and not influenced by the consultant.

### 7.1.6) Influence on the Contract Administration group of Claims

From the data analysis, we see that consultants do influence the contract administration group of claims in the sub hypothesis, although the main hypotheses that the parties to a project do not influence the type

of claim was accepted. The claim on poor coordination between contractors will be influenced by the consultant if his role was to coordinate the work between several main contractors or work, beside being a consultant as a construction manager who has the job of orchestrating the efforts of several sub contractors. Construction management in Saudi Arabia is not widely popular and few large projects are only managed by a construction manager. The claim on delayed payment by owner will be influenced by the consultant if he delays the processing and checking of payments which would have a chain effect on the delay of the owner in paying to the contractor. The claim on delayed handover of site to the contractor will be influenced by the consultant if the delay was due to the consultant, either because of his technical or managerial weakness. The claim on stoppage of work by owner will be influenced by the consultant if he gave the wrong advice to the owner to stop the work, or due to the weak supervision by the consultant there emerged some difficulties on site that necessitated such a stoppage. The claim on the dispute on reimbursement of owner-caused delay will be influenced by the consultant if he does not advise the owner properly on the fair compensation or takes a hard line approach during the negotiation with the contractor. The same argument will apply to the claim on dispute on reimbursement due to owner directed acceleration. Consultants in Saudi Arabia are expected by owners to be their representatives and not act independently. While some consultants might act impartially and independently, there is no definite guideline on this matter because still there is no professional body in Saudi Arabia to represent all consultants and draft the necessary guidelines of the profession. The same argument above is applicable to the claim on dispute on reasonable ***time*** extension or on the reasonable market value of variation orders. Some consultants cannot deal professionally with matters on ***time*** and cost, and if the

contractor were a learned one, there will be some problems in dealing with such consultants. Here, a technically weak consultant will influence such claims by his poor management and advice to the owner. The claim on timing of variation orders will also be influenced by the consultant through his late response to the needs of the project. He will as well agree to the untimely requested variation orders by the owner and not advice him on this matter. A consultant will also influence such claims if he did not help the owner to know his needs of the project in an early stage in order to minimize the issuance of such variation orders in an untimely manner. The claim on variation orders not paid on time will be influenced by the consultant if he did not act in a timely manner with the request of payment issued by the contractor and this will effect the necessary period for the owner to review and issue the payment. The claim that variation orders being extensive will be influenced by the consultant if he did not review the design drawings and the contract documents early enough to discover any needs for amendment or completion, which will minimize the need to issue variation orders. The consultant will also influence such a claim by not advising the owner properly to minimize his variation orders for the benefit of the project. The claim on the consultant being uncooperative will no doubt be influenced by the consultant who does not put the benefit of the project as his first priority. The claim on poor documentation will be influenced by the consultant if his documentation is not done the proper way. Government contracts ask consultants to keep the documents for the project for ten years after the completion of the project. This is required to help the government agencies with any cases filed against them by the contractor. This clause had been added to government consultancy contracts after several government agencies failed to reply to contractors' cases at court due to poor documentation of the consultant and obviously by the government agencies as well. The

claim on contract not specifying the dispute resolution method will also be influenced by the consultant, who either drafts the contract for his client (the owner) or does not advise his client on the missing clauses in the contract. A professional consultant will advise his client to use a well-known model of contract and will undoubtedly recognize any necessary amendments to suit the construction industry environment in Saudi Arabia. The claim on contract documents being ambiguous, contradictory or incomplete will as well be influenced by the consultant, who does not go over the contract documents, if prepared by another consultant, to see any such discrepancies. Although government contracts put the burden of such review on the contractor, yet it still puts it in another contract with the consultant on him too. The claim on that the contract period is not enough will be influenced by the consultant if he himself determines such a period without the necessary knowledge or accepts such short durations from a contractor who suggests such short durations to encourage the owner to take his bid. In any case, the consultant should be competent to judge on the necessary duration for completion of the project, and should advise his client faithfully on such matters. Finally the claim on a nominated sub-contractor will be influenced by the consultant if he nominated in the contract the wrong sub-contractor, or if he does not listen to the objections of the main contractor at the negotiation stage on such a nominated sub-contractors, and the consultant insists on keeping such a sub-contractor on the job.

### 7.1.7) Influence on the Information and Technical based Claim group

From the data analysis, we see that consultants do influence the type of claim in the information and technical-based claim group. This sub-hypothesis and the one on contract-administration which also showed that consultants did influence the contract-administration type of claims, these

two sub-hypothesis were not enough within the six groups of claims to change the main hypothesis that the party to a project does not influence the type of claim. The information-based group of claims has such claims as construction defects by the contractor. The consultant will influence such a claim if he gave the wrong instructions to the contractor, which led to this defective work. The consultant will also influence this claim if due to weakness of his supervision the contractor made the defective work. The claim on poor material used or supplied by the contractor will be influenced by the consultant it he was the one who specified it in the contract documents in the first place. He will also influence this claim if he accepted such poor material submitted by the contractor, or due to poor supervision, he did not notice the supply of this poor material to the site. The same argument is applicable to the claim on poor workmanship or ***quality*** of work. The consultant will influence this claim by accepting such a contractor to participate in the project in the first place. He will also influence it through his poor supervision or poor technical and professional skills. The claim on poor technical skills of the contactor's staff will be influenced by the consultant if he did not thoroughly examine the contractor's staff's previous experience and resumes. He should be able to identify any weaknesses in the technical skills of the contractor's staff early in the project life, either before commencing the work or in the early stages of construction. The claim on the poor technical skills of the owner's staff is not usually influenced by the consultant, unless he was asked to advise the owner on the suitability of the owner's technical staff for the job. The claim on the poor technical skills of the consultant's staff is obviously influenced by the consultant who did not appoint the necessary expertise for the project, and this will have a great negative **effect** on the project. The claim on poor management by contractor's staff will also be influenced by the

consultant if he chose the wrong contractor for the project or if he did not make sure the contractor's staff were of the necessary calibre. The claim on that the project was under priced will be influenced by the consultant if he participated in choosing the lowest bidder in spite that his price was lower than estimated. The consultant should be aware of the necessary techniques of choosing the right contractor. The claim on the dispute on the percentage or cost of added or deleted items will be influenced by the consultant if he, contrary to the contract clauses, asked the contractor to delete or add a percentage of work more than permissible under the contract. He will also be technically incompetent to negotiate with the contractor the cost of those items deleted or added. The claim on delay in approval of drawings, material, work performed, measured quantities or tests will be influenced by the consultant if the delay in approval was due to his technical incompetence or due to shortage in his manpower. The problem could be due to weakness in the consultant's management system or due to his poor documentation. The claim on that the code for work was not specified will be influenced by the consultant if he prepared the contract documents without specifying the necessary code for work. He will also influence this claim by not reviewing the contract documents for any defects or missing items. Saudi Arabia is working now on its own code called the Saudi Standards. It is not yet ready, and will take several more years to materialize. The construction industry uses either the American Standards (ASTM) or the British Standards (BS). Many contracts in the private sector do not specify the necessary code, but will replace it with some vague description like "using the highest standards". Obviously, this will create lots of problems and claims. The claim on specifications being unclear, contradictory or incomplete will as well be influenced by the consultant if he were the one who prepared these specifications, or if he did not review them properly to make up for any

discrepancies. The claim on delay of submittal of drawings by owner, consultant or contractor will also be influenced by the consultant. If the submittal were by the owner and the consultant was required to furnish the owner with necessary information or data and the consultant was late in such submittal he will influence this claim in this way. If the drawings were required to be submitted by the consultant himself then obviously he will influence this claim, either due to his poor technical skills, management skills or poor documentation. If the drawings were required to be submitted by the contractor, the consultant will as well influence this claim if he were late in presenting the necessary information to the contractor in order for him to complete his submittal. The claim on poor submittal by the contractor of shop-drawings, as-built drawings or schedules will not usually be influenced by the consultant unless he was the one who chose this incompetent contractor in the first place, or did not have the necessary knowledge of contractor selection techniques, or even did not advice the owner on not selecting such a weak contractor. The claim on original design being incompatible with the local conditions, capability of the local contractors, suppliers or manufacturers will be influenced by the consultant if he were the designer and did not take in his consideration the standard of the local construction industry. He will also influence this claim by not reviewing the original design and commenting on this issue. During the construction boom in the seventies and early eighties, many large projects were designed by international consultants who designed these projects with the idea in mind that they will be constructed by international contractors too. This trend has decreased since then and currently most construction projects are constructed by local contractors, who use local manufacturers and suppliers whenever possible. The claim on design drawings being incomplete, contradictory or having errors will as well be influenced by

the consultant if he were the one who prepared them in the first place or if he did not properly review these drawings to pin point any discrepancies in them, or that he did not review them at all. Such poor technical skills by the consultant will surely have its negative effect on the project. Last, the claim on there being large differences between original and actual quantities will be influenced by the consultant if he were the one who prepared the quantities in the first place or he did not go over the quantities to compare them with the design drawings. Of course, this claim could be due to the consultant ordering the contractor to execute additional work to the contract without giving him the necessary compensation.

## 7.2) Discussion of Hypothesis No. 2

**H2 : There is no difference between the type of claims submitted in government or private projects.**

This hypothesis was supported by the results of the analysis made using the chi-square test and the proportion test and by the weighted associations. Four out of six sub-hypothesis were accepted and supported by the data in the government group of projects. It was seen that Acts of God claims submitted in government projects were not different from those submitted in private projects. Claims in this group were built on causes of earthquakes, inclement weather, floods and typhoons. It is obvious that these claims will arise in any project that is associated with any of the previous claim causes. Being a government project will not particularly influence such a claim, as these claims are caused by a third party not a contract party, and they are mainly initiated by the contractor who, in his claim, is only reacting to such causes of claims. It was also seen from the data that man-made claims in government projects were not different from those submitted in private projects. Such claims in this group like war, strikes, fire, pollution and change in legislation will be associated with projects of both ownerships government or private. These causes of claims are all due to third parties actions and the affected party to a project will claim for compensation whether in government or private projects. It was also seen from the data that the site condition group of claims in government projects were not different from those submitted in private projects. This group of claims contains such claim causes as limited access to the site. This claim cause is independent of the ownership types, as this limited site access will happen in government as well as private projects. This claim cause will be due to a party to the construction contract or due to a third party. In either case, the possibility

of this occurring to any project is independent of the ownership type. The claim on unpredictable subsurface conditions is also independent of the ownership type as it may happen in either government or private projects. The government, as a project owner, usually puts the burden of site investigation on the contractor. He will be obliged to build the necessary foundation at the cost mentioned in the contract, whatever the kind of soil turns to be or whatever types of foundation the consultant might suggest to suit soil conditions. The private sector might duplicate the government's position on this matter or take a different one. The claim on historical ruins or cemetery found on site will happen to any project and is not influenced by the government ownership to the project. The government may differ from the private sector in how it deals with the problem of historical ruins or cemetery found on site of a project, but still this does not alter the fact that this claim cause is independent of the ownership of a project. The claim on disputed ownership of a construction site is not also influenced by the government ownership, as this is also a reaction to a third party's actions, and could happen to any construction site, whether government or private. It was also seen from the data that market-driven causes of claims were not different in government projects from private ones. The claim on inflation of costs or currency fluctuation is due to the market forces and is an impact on the construction industry environment by the country or general environment. Claims built on these causes are a reaction by the affected party to a project to those market forces, and could be initiated in either government or private projects. Usually government agencies will not accept claims from contractors built on such market-driven causes, and contractors have to take their claims to the Board of Grievances to sort out the matter. The claim on shortage of basic resources or services will happen in any kind of ownership, as this is a result of general political or economic causes,

that will be associated with any project in the country, whether government or private. Such claim causes are rare in Saudi Arabia. The government as owner is usually reluctant to accept such claims from contractors and will generally end up in court with the contractor to sort out such claims.

### 7.2.1) Government Ownership Influence on the 'Contract Administration' group of Claims

From the data analysis, we see that the contract administration group of claims in government projects are different from private projects. This sub-hypothesis differs form the main hypothesis that there is no difference between the types of claims submitted in government or private project, which was accepted as a main hypothesis. The claim on poor coordination between contractors will be influenced by the government ownership in that government projects do not have multiple prime contractors. The only type in government projects is that of a main contractor with other sub-contractors. This claim will arise due to the lowest bidder method used in selection of contractors in government projects and due to the lack of prequalification for projects under five million Riyals. This approach will lead to weak contractors being awarded contracts, which they cannot run, and thus their poor management and co-ordination of sub contractors. The claim on delayed payment by the owner will be influenced by the government ownership in that its contract states that a contractor must not stop the work on the project because of delayed payment by the owner, and if he does, the government can terminate him and assign another contractor to complete the work, while claiming from the contractor whatever extra charges it might incur to do so. In practice, contractors may wait for months to get their first monthly payment. This is the case after the Second Gulf War in

the early nineties when the government incurred great debts to cover the war expenses. The claim on delayed site handover to contractor will be influenced by the government ownership in agencies with shortage of manpower and heavy construction programs. As routine work, a project site will be delayed in handing over to a contractor unless that project was of a high priority and was followed up by higher management. The claim of stoppage of work by owner will be influenced by the government ownership due to that most government agencies do not think of this stoppage as harming the contractor and they sometimes quite easily direct the contractor to stop the work for unnecessary reasons. Such government personnel lack the knowledge of the economic value of ***time***. Although government contracts provide for compensation to the contractor for owner-directed stoppage of work, yet most contractors have to go to court to get their compensation for such claims. The same argument applies to the claim on dispute on reimbursement due to owner-caused delays. The government in most cases will compensate the contractor with extension of ***time*** and no ***money*** for any delays caused by government agencies or personnel. Large loads of work and shortage in manpower in government agencies will add to the problem of delays caused by the owner. In one case, with an international construction company, the government agency took eight months to approve some material samples, although the contract stated one month as the maximum period for the owner to reply on material approval. Knowing all that, the government agency still denied the contractor the reasonable extension of ***time*** and refused to negotiate any compensation to him for such owner-caused delays. The contractor had to take the government agency to court at the Board of Grievances. The claim on dispute on reimbursement due to owner-directed acceleration will also be influenced by the government ownership. ***Time*** extension is rarely granted to contractors for any reason.

That is why a government agency will still ask the contractor to deliver the work on the date specified by the contract and claim later for any compensation. This situation of owner-directed acceleration is not comprehended by some government personnel and by many contractors, especially small ones. Rarely will any small contractor be aware of how to calculate the cost of acceleration. The same applies to some government personnel. The claim on disputed ***time*** extensions will as well be influenced by the government ownership. Most government agencies in Saudi Arabia will not grant extensions of ***time*** for whatever reason to a contractor. They will ask him instead to take his claim to court. This position from government personnel makes them secure from punishment or investigation in case they were wrong in granting the extension of ***time*** to a contractor. The government would not mind if the court granted that extension of ***time*** with relief from delay penalty and any compensations herein. The claim on disputed reasonable market value of variation orders will also be influenced by the government ownership. Government contracts do not contain provisional rates for items that may be used for change orders. There is no price index for materials, machinery or workmanship that can be used as a basis for determining the fair market value for variation orders. In the absence of such guidelines, the only way to agree on pricing of variation orders is through negotiation. Government agencies are known to be tough negotiators and contractors are expected to claim the lowest price for the variation orders. The claim on variation orders given in an untimely way will be influenced by the government ownership. Government projects are designed as prototypes to be constructed in every corner of the country. With a country of two million square kilometres of area and topographically very diverse, such prototypes can generate several needed variation orders. The relaxed business atmosphere of the government agencies will lead to late or

untimely variation orders. Shortage of personnel and large workloads could aggravate the problem. The claim on variation orders not being paid on time will as well be influenced by the government ownership. This case is the same as delayed payments. In both cases the contractor has no right to stop the work under the contract provisions, and might claim whatever expenses he incurred due to this late payment, either to the government agency or, if denied by it, to the court (Board of Grievances). The claim on variation orders being too many will be influenced by the government ownership. The previous discussion on prototype designs of projects such as schools, hospitals, medical units and housing units is applicable here. The prototype approach will lead to too many variation orders being issued by the owner. Another cause will be the poorly prepared designs in-house, either by government agencies, or by independent consultants. The government method of choosing the least bidder in consultancy jobs will lead to such poor design drawings, and if coupled with poor review by the owner, will most probably lead to the issuance of lots of variation orders. The claim on that the consultant being un-cooperative will be influenced by the government ownership. The previously discussed method of choosing the lowest bidder consultant will lead to choosing the wrong consultant, who is technically or administratively weak. Non-cooperation therefore is a natural result for this process of selection. Another cause for non-cooperation of consultants in government projects is that government agencies expect consultants to be harsh on contractors so as to protect the general benefit of the society and help in preserving its wealth. Consultants working on government projects, from their part, want to be looked upon as clean handed and would be uncooperative with contractors and sometimes harsh on them to prove the point. The claim on poor documentation will be influenced by the government ownership. The lowest bidder consultant

selection technique used by government agencies will lead to choosing the wrong consultant. A major weakness in such a consultant would be his poor documentation skills. Government agencies themselves are not quite efficient at good documentation, and many a case at court was lost to contractors due to this low standard of documentation. The claim on the contract not specifying the dispute resolution method is not applicable here to government ownership because the construction contract model used by government agencies, which is called the Public Works Contract, specifies such dispute resolution method. It starts by negotiation and if the dispute is not resolved, it will be taken to the Board of Grievances. The claim on contract documents being ambiguous, contradictory or incomplete will be influenced by the government ownership. If the design and contract documents were made in-house, the influence of the claim on discrepancies in the contract documents will be clear. If the contract documents were prepared by an independent consultant who was selected by the lowest bidder method it will also be clear that government ownership influences this claim. In any case, the government agency must review the contract documents prepared by any independent consultant before such documents are tendered to contractors. The claim on specified project duration being insufficient will be influenced by government ownership. If the government agency specified this duration without sufficient knowledge of the required time for such activities or asked an independent consultant to do so without discussing the details with him, this government agency will surely be influencing such a claim. It will also influence this claim by agreeing to accept an unreasonable period suggested by a contractor who is looking to win the bid by any means, or planning to claim for extension of ***time*** later in the project life. The claim on nominated sub-contractor is not applicable in the government ownership. The Pubic Works Contract usually used in

government projects does not allow the owner to nominate any sub contractor or even a supplier. This is meant to keep the government from favouring any specialized contractor or any supplier.

### 7.2.2) Government Ownership Influence on the Information-based Claim group

From the data analysis, we can see that the sub-hypothesis that government ownership does not influence the information based claim group was rejected, although the main hypothesis that ownership type does not influence the type of claim was accepted. The rejection of this sub-hypothesis and the sub-hypothesis on contract-administration claim group was not enough to make the main hypothesis rejected. The claim on construction defects by contractor will be influenced by government ownership if that contractor was selected on the least bidder basis and with no prequalification, as is the case with projects under five million Riyals. The claim on poor material used or supplied by the contractor and the claim on poor workmanship or ***quality*** will also be influenced by government ownership due to the wrong selection techniques of contractors or due to poor supervision by the consultant who is sometimes selected the same way as contractors through the least bidder method. The claim on poor skills of technical staff of contractor, owner or consultant will also be influenced by the government ownership. The wrong method of selecting the contractor and consultant will result in poor technical skills of their staff. The review by owner of the consultant's staff resumes and by the consultant of the contractor's staff resumes will partially improve this weakness. The poor skills of the technical staff of the owner might be due to that government wages are no match for the private sector, therefore not attracting the best in the market. The on the job training programs are not enough to upgrade the

government employees skills to the required standards, and the employee selection method does not provide high calibre personnel to the government positions. The claim on poor management by the contractor will also be due to the selection method of the least bidder and no prequalification to contractors in small government projects. The claim on the project being under priced will be influenced by the government ownership due to that the government agencies will not disqualify any contractor who bids much lower than the project budget, but will rather accept his bid and award him the contract form the point of view that this is saving ***money*** to the treasury. In addition, the usual practice in government agencies is that they will ask the lowest bidder for a special discount before signing the contract. Of course, this has a great negative **impact** on the construction output and the problems of ***function***, maintenance and life cycle cost of the project. The claim on the dispute on percentage or cost of items added to or deleted from the bills of quantities will as well be influenced by the government ownership. The Public Works contract used by the government agencies clearly specifies that additions to the contract value must not exceed 10% and deletions must not exceed 15%. The problem happens when the government agency needs to add work worth more than the specified 10% or delete more than 15% (deletion is very rare of more than 15%). The government agency must get the approval of the Ministry of Finance before it could proceed with this addition. Such matters could take months to finalize. There is a debate going on now between contractors and government agencies on whether the deletion or addition percentages specified in the contract could be made from one item in the bills of quantities or that the maximum deletion from any one item is the specified 15%. The other problem is with the dispute on cost of items added to the bills of quantities. Usually there is no provision for added items in the Public

Works Contract; therefore, there will always be a dispute over the fair price of added items, especially in the absence of any price indices in Saudi Arabia that can be consulted as guidelines in this regard. The claim on delay in approval of drawings, schedules, material, and work performed, measured quantities or tests will be influenced by the government ownership if the delay was due to its employees. The work atmosphere in government agencies is a bit relaxed and there could be a big workload on some of the government employees, which will result in such delays. The type of central management used in government will add to this problem. If the delay were due to the consultant, then it will be due to the selection of the wrong consultant by using the least bidder method, or due to that the government agency is not monitoring the performance of its consultant. The claim on that the code is not specified in the contract documents is not applicable here because the Public Works Contract states that the Saudi Code is to be used in construction, although the Saudi Code did not yet cover all items of work in the different trades. The government agencies will ask contractors to use the American ASTM for any items missing in the Saudi Code which is due to be published in it's final format in 2007. The claim on specifications being unclear, contradictory or incomplete will be influenced by the government ownership. The poorly selected consultant who produces the specifications will be the cause of such a claim, and the wrong selection technique will be to blame here. The government agency might not review the specifications produced by the consultant and in this way, it adds to the problem. The claim on delay of submittal of drawings by the owner, consultant or contractor will as well be influenced by the government ownership. If the delay were due to the owner, then it is obviously influenced by the government ownership. If the delay were due to the consultant, then it will be due to selecting the wrong consultant for

the job. The same applies for the delay of drawing submittal by the contractor. The claim on poor submittal by the contractor on shop drawings, as-built drawings or schedules carries the same previous discussion on the wrong selection of the contractor. The consultant will add to this problem if he were technically weak and did not guide the contractor professionally. The claim on that the original design was incompatible with the capabilities of local contractors / suppliers or manufacturers will be influenced by the government ownership if the government as owner, contracted the design work to an international consultant, without making him aware of the local construction industry environment, then the government will be influencing such a claim. The government used to design its large projects with international consultants until the mid eighties, when it turned to local consultants who have accumulated enough expertise to do such design work. The government is still using the service of large international consultants for its complex petrochemical, power- generating or desalination plants, in which case the contractor will be an international one. Alternatively, the government will resort to design / build arrangements to relieve itself of some of the risks associated with the regular design –bid– build arrangement. The claim on design drawings being incomplete, contradictory or having errors will also be influenced by the government ownership and the previous discussion on poor selection techniques of consultants, selecting the least bidder and not monitoring the output of these consultants could no doubt add to this problem. The government agency could have designed the project in-house using its own personnel, and this of course will influence such a claim. The last claim that will be influenced by the government ownership is that on great differences between original and actual quantities. The selection of the wrong consultant will be applicable here too, and the lack of monitoring his output will add to the problem.

Another factor is the large number of variation orders issued by the government agency, which could be due to the little initial effort put at the preliminary and design phases of the project, which resulted in needing a lot of changes during the construction phase

### 7.2.3) Discussion of the Private Ownership influence on the type of claim.

In discussing the private ownership, we find from the analysis of data that the main hypothesis, that there is no difference between the type of claims submitted in government or private projects, was accepted. The same applies to private ownership, which will be discussed here in detail. Six sub-hypothesis were checked against the results of the analysis. Four sub-hypothesis were accepted and two were rejected. It was seen from the analysis that private ownership did not influence the 'Acts of God' claims, which contain such claims as typhoons, floods, inclement weather and earthquakes. These claim causes would hit any project whatever the ownership is, and no project is safe from such causes. These claims come as a reaction by the associated party to a project, and the owners of a project whether as claimants or defendants will have no influence whatsoever on the causes of such claims. It was also seen from the data that ownership type did not influence the man-made claims. Claims in this group contain such claims like war, strikes, fire, pollution and change in legislation. All these claim causes are initiated by third parties and the ownership type would not have an influence on this type of claim. So whether the ownership is private or government, the projects and the project parties would be subjected to the same association, on which they have no influence. The site conditions group of claims was also found from the data that they were not influenced by private ownership. The claim on limited access to site will not necessarily be influenced by the

private ownership, which has some influence on that claim cause if the limited access to the site was due to that owner, but this claim cause will mostly be associated with third parties, like the police or municipality. The claim on unpredictable subsurface conditions will slightly be influenced by private ownership due to the choice of a certain site, or if the owner was responsible to present the necessary soil investigations to the contractor, but mostly this claim cause will be associated with the conditions of the soil, which are independent of the private ownership. The same argument applies to the claims on historical ruins or cemetery found on site. The claim on disputed site ownership will be slightly influenced by the private ownership by the choice of a particular site, but mostly there will be third parties influencing such a claim cause more strongly than the ownership type. The market-driven group of claims was also found from the data that they were not influenced by private ownership. The claims on inflation of costs and currency fluctuation are generated by the economic and political environment of the country, and the project owners will only react to such causes of claims and will not influence them. The claim on the shortage of basic resources or services is also independent of ownership of a project. This claim cause is influenced by third parties and the private ownership of a project will have no influence on such cause of claim. Anyhow, these claims built on market-driven causes are not common in Saudi Arabia due to the fixed rate of the Riyal to the US Dollar and the maintenance of inflation under good control by the government. The shortage of basic resources or services happened only during, and right after, the second Gulf War in 1991.

### 7.2.4) Influence of private ownership on the contract administration claim group

The data show that the sub-hypothesis that there is no difference between claims submitted in Government or private projects in the contract administration group of claim was rejected, which means that ownership of a project will influence the contract administration group of claims. The claim on poor coordination between contractors will be influenced by the private ownership, as in these projects there might be several prime contractors that are managed by the owner or by his construction manager. It will happen that there are mixtures of main and sub contractors that are wholly or partially managed by the owner or his construction manager. Government projects do not have such procurement methods and only adopt the main contractor type. The claim on delayed payment by owner will be influenced by private ownership. Owners in small projects in the private sector are known to be bad paymasters in general. Some owners in the private sector would like to delay the payments in order to retain as much ***money*** as a guarantee instead of having a bank guarantee submitted by the contractor. Down payments in the private sector are mainly paid without any guarantees, so some owners would think of retaining some ***money*** and delaying payments in order to make up for any losses in case the contractor defaults or goes bankrupt. The claim on delayed handover of site to contractor will be influenced by the private ownership, because in private projects the owner has the upper hand and will manage the project his own way without real knowledge of the basics of management. He might not have a consultant to aid him in the management of the project, and even if he had one, he will still direct the project as he pleases. Of course, this type of owner does not value the ***time*** factor, and will cause serious

damage to his contractor. One of the main problems with such owners is the late handover of the site to the contractor. The same argument mentioned above is applicable to the claim on stoppage of work by owner. Most small private owners are not aware of the impact any stoppage of work will have on the contractor. They think that by stopping the work on site the contractor will lose nothing as long as no work will be carried out on site. Due to their poor management, these owners are not ready to approve samples of materials, thus putting the contractor in a position where he has to stop the work until the owner approves the samples in order to proceed with the work. This is a common practice in the Saudi private sector. Amazingly enough, small contractors do not claim usually any compensation due to this stoppage of work, either to keep ***future relations*** with the owner or out of their ignorance of these matters. The claim on dispute on reimbursement of owner caused delay will be influenced by the private ownership. The previous discussion on the poor management by owners of their projects is applicable here. Some private owners might not approve at all of any right to the contractor to a claim based on owner-caused delay. Some of them will fight to give the contractor the minimum of compensation. Most of them will not have the knowledge or expertise to calculate or use the right method of compensation, and even their consultants, if asked to help, might not be ready to give the right advice. Most important, almost all small contractors have no idea how to present a professional claim to the owner built on compensation of owner-caused delays. The same previous argument is relevant to claims on disputes on compensation due to owner-directed acceleration. As long as owners do not understand the cost or value of ***time***, they will ask contractors to accelerate by finishing on time, even-though the owners delayed them throughout the project. Most small private owners will not have heard of costs of acceleration, and many

small contractors will not have as well. The claim on disputes over reasonable ***time*** extension will also be influenced by private ownership. Owners in the private sector in Saudi Arabia are known to be very tough on contractors. They expect their consultants to be the same. Therefore, if a contractor claims an extension of ***time*** they will try to minimize whatever he will get of ***time*** extension, for no good reason, but for their perception of contractors as usually over-claiming. Most contractors in Saudi Arabia will over claim, putting in mind that owners are tough negotiators and will not easily accept any claims from contractors. Owners in small projects and some of their consultants as well, do not have the necessary tools to evaluate a ***time***-based claim. Most contractors as well are not familiar with presenting professionally prepared ***time*** claims. The same argument is applicable to the claim on dispute over reasonable market value of variation orders. Most construction contracts used in the private sector do not include provisional rates for items that might be used in the project. There is no guideline to help with calculating the fair price of variation orders. The claim on variation orders given tardily will also be influenced by the private ownership. Previous discussions on how private owners manage their projects are applicable here too. Because most private owners do not understand the principles of scheduling, they will not understand the effect untimely variation orders will have on the time and cost of the work. Small owners will not have a clear view of their needs from a project during the design phase, and will keep giving variation orders until the end of the project. A well-known phenomena in the Saudi private sector in home construction is that wives interfere late in the project life and make changes that could have been avoided if previously incorporated in the design phase. The claim on variation orders not being paid on time will as well be influenced by the private ownership. The previous argument of private

owners being bad paymasters and being tough on contractors is applicable here too. Most small owners have tight budgets and do not welcome spending on variation orders. The claim on variation orders being too many is influenced by the private ownership as well. Most small private owners in Saudi Arabia would design their buildings paying just a fraction of what other neighbouring countries have decided by law to pay to architects. Some pay as low as 10% only of the schedule of fees in comparison to Kuwait or Bahrain. There is no schedule of fees in Saudi Arabia yet. Normally many mistakes and problems are associated with these cheap designs. Most uneducated owners will not exert any effort in discussing their needs with the designer. The result is that most of these cheap designs, when constructed, will not fulfil the needs of the owner and he will have to issue too many variation orders to make for the shortage in the design. Some small private owners would change their minds a lot during the project construction, phase, and some will incur financial difficulties that will force them to make such many variations. The claim on the consultant being uncooperative will also be influenced by the private ownership. Some private owners would employ unqualified consultants, and might not pay them sufficiently. This will undoubtedly have a negative effect on how the consultant will perform. Moreover, usually small private owners do not monitor the performance of their consultant and most of them think that a cooperating consultant means a link with the contractor, so they still see that a harsh un-cooperating consultant is the best choice for their project. The claim on poor documentation will also be influenced by the private ownership. Small private owners are usually managing their projects themselves, and being non-professional managers, it is obvious that they will not have the proper documentation for their project. These owners will employ a low ***quality*** consultant who will manage the documents poorly. Even some

contractors who work for the private sector are unqualified and usually put all their effort in performing the work on site and think that managerial matters are less important than work done on site. The claim on that the contract does not specify the dispute resolution method will also be influenced by the private ownership. Most small private owners draft the contract themselves or ask their contractor to do so. Some take copies of construction contracts from friends or relatives. Such contract models are far from being professional and are the cause of lots of disputes and claims. Some private owners will not get the necessary advice from their consultant, either because they underpay him or because he has chosen the wrong consultant for the project. The claim on contract documents being incomplete, ambiguous or contradictory will also be influenced by the private ownership. Some private owners will, as mentioned above, draft their own contracts or ask the contractor to do so. Such contracts will undoubtedly be incomplete, ambiguous, or contradictory. The other contract documents prepared by the consultant will be affected by the fees he is getting from the client. Some private owners negotiate very low fees with some consultants, which will definitely affect the performance of the consultant who will produce contract documents full of defects. The claim on the specified project duration being insufficient will as well be associated with the private ownership. Some private owners will try to specify unrealistic project durations on the hope that a contractor will accept this condition. These might not get the suitable advice from their consultant, or they might not have one at all. Some contractors, out of ignorance or out of need for work, would accept such unrealistic project durations. Some contractors will try to make up for this by claiming extensions of ***time***, but mostly will get into trouble with such owners. The claim on the nominated sub-contractor will also be influenced by the private ownership. Only in

private projects can an owner nominate a sub-contractor. It is not allowed to do so in government projects as stated before. Some private owners will nominate a sub-contractor that was recommended to them by a friend or relative without making sure he is suitable for this specific project.

### 7.2.5) Influence of private ownership on the information-based group of claims

The data shows that the sub-hypothesis that there is no difference between claims submitted in government or private projects in the technical and information-based group of claims was rejected, which means that ownership of a project does influence the technical and information-based group of claims, although the main hypothesis that there is no difference between the type of claims submitted in government or private projects was accepted due to the acceptance of four out of six sub-hypothesis. The rejection of two sub-hypothesis did not change the overall acceptance of the main hypothesis. It is evident that the nearer the parties to the project are to the type of claim the more influence they have on it, and the more distant they are from the type of claim (as in Acts of God claims) the less influence they will have on the type of claim. The claim on construction defects by contractor will be influenced by the private ownership if a private owner selects an unqualified contractor to construct his project. This will as well be coupled with unrealistically low prices of construction, which surely will end up in defective work on site. The matter could worsen by not employing a consultant to supervise the work or choosing a low fee consultant who will most probably add to the problem. The same argument applies to claims on poor material used or supplied by the contractor, who will try to make up for his low prices by using cheap materials. The claim on poor workmanship or poor ***quality*** by contractor has the same background as the claims above. An owner

who selects a contractor on based on his low bid must expect all kinds of corner-cutting by this contractor. The matter can get graver if there were no consultant to inspect the work or that there were a consultant who was underpaid to do the job. The claim on poor skills of technical staff of the contractor, owner or consultant will be influenced by the private ownership. The poor technical skills of the contractor's staff will be due to the selection of the lowest bidder, which is quite common in the private sector. In addition, selection with no previous pre-qualification could add to this problem. The matter will worsen if there were no consultant to check the skills of the contractor's staff before they were allowed on site, or that their was a consultant who did not do his job of checking the skills of the contractor staff. The poor skills of the technical staff of the owner are obviously influenced by the private ownership. Private owners will not have their own technical staff unless it was a large project they were constructing. If they choose the wrong staff or look for the cheapest staff in the market, they will undoubtedly be influencing the claim. The poor skills of the technical staff of the consultant will also be influenced by the private ownership if private owners hired the wrong consultant or did not pay him the right fees. Most private owners do not have the necessary tools to judge on the competence of the technical staff of the consultant. The claim on poor management by contractor will also be influenced by the private ownership through poor selection techniques as mentioned earlier. The claim on the project being under priced will also be influenced by private ownership if the private owner selected his contractor on the least bidder basis. Some private owners might directly select a contractor they new or were referred to by a friend or relative, and specify the contract sum without using the right approach to selection. Some contractors might agree to such under priced projects, with the idea of making their profit through variation orders. The claim

on the dispute on percentage or cost of items added or deleted from the bills of quantities will be influenced by the private ownership, as long as there are private owners who draft their own contracts, and there will always be problems arising from such contracts. Some private sector contracts do not address the subject of variation orders or the percentage allowable under the contract for addition or deletion. These contracts would not have provisional prices of items that can be added during the course of work. If the contract were on a lump-sum basis, most probably, it will not contain priced bills of quantities, and thus, deletion of any items of work in the contract would pose a problem to its parties. Most small private owners will leave many details to be dealt with as and when they occur, which gives rise to a high possibility of disputes and claims between owners and contractors. The claim on the delay in approval of drawings, schedules, materials, work performed, measured quantities or tests will be influenced by the private ownership, if the private owner is managing his project by himself, and this will cause delays in approvals, as most small private owners have little knowledge of the basis of management. If the owner is managing his project through his own personnel, then he will influence the delay in approval through his management style, or by not efficiently monitoring his staff's performance. If the private owner is managing his project through a construction manager or a consultant, then he will influence the delay in approvals by selecting the wrong professionals for his project, or through inefficient monitoring of their performance. It was previously discussed that small private owners building their home would change their minds frequently and some of the delay of approvals will be connected to this and to the late participation of wives and family members in selecting materials or approving drawings. The claim on specifications being unclear, contradictory or incomplete will be influenced by the private

ownership. In some cases, small private owners would ask the contractor to write the specifications for the project, and expecting the non professional competency of the contractor we could foresee the problems with such specifications. The previous discussion of choosing under qualified consultants or underpaying them or even not giving them the sufficient time to finish the job is applicable here too. The claim on delay in submittal of drawings by owner, consultant or contractor will be influenced by the private ownership. If the owner were to submit the drawings and he delayed them for any reason, he would thus influence this claim. Some large private owners have their own engineering departments, and if this department delayed submission of the necessary drawings because either of poor management or poor follow-up by higher management, this will undoubtedly associated with this claim. If the drawing were to be submitted by the consultant, still the private ownership will influence this claim by choosing the unqualified consultant or by not monitoring his performance. If the contractor were to submit his own drawing and delayed it, this could be influenced by the private ownership by choosing a weak contractor in the first place or a weak consultant who does not efficiently manage the project, or by not monitoring the performance of both the consultant and the contractor. The same argument will apply to the claim on poor submittal by the contractor of shop-drawings, as-built drawings or schedules. The claim on original design being non-compatible with the capabilities of local contractors / suppliers or manufacturers, will also be influenced by the private ownership. Some private owners used to design their projects abroad and ask local contractors to construct them, without giving the international designer enough information on the local construction industry environment. Some international designers will not bother to gather such information, and the result might be a design that needs certain new

technologies to be constructed in Saudi Arabia, or the work needs certain machinery that is not available in the local market. Most private owners have switched to local consultants in the last decade, after these accumulated enough experience to enable them to convince large private owners of their abilities. The claim on design drawings having errors or being contradictory or incomplete will be influenced by private ownership if private owners insisted on hiring the least bidder consultant or insisted on sometimes paying as low as 10% of the scheduled rates in neighbouring countries. This way they will be planting the first seed of disputes in their projects. Last, the claim on great differences between original and actual quantities will be influenced by private ownership due to that the bills of quantities were not properly prepared, or because of any discrepancies in the design drawings, or that these drawings were not coordinated with the right information from the site. In any case, the private owner will influence this claim through his selection of the designer and the ***time*** he allows him to complete the job and the fees he will pay to this consultant.

### 7.3) Discussion of Hypothesis No. 3

**H3 : The size of the project has no influence on the type of claim.**

This hypothesis was supported by the results of the analysis made using the chi-square test and the proportion test and by the weighed associations. Four out of six sub-hypotheses were accepted and supported by the data in the under five million Riyals group of projects. This leads to the acceptance of the sub hypothesis that small projects (under five million Riyals) do not influence the type of claim. We can see from the data that the more distant the parties to a project are from the type of claim (as in Acts of God or man-made claims) the less influence they will have on the type of claim, and the nearer the parties are to the type of claim (as in the contract administration group), the more influence they will have on it. Acts of God claims are not influenced by the size of the project as seen from the analysis of the data. This implies that small projects (under five million Riyals) do not influence the Acts of God claims. This group of claims contains such claim causes as typhoons, floods, inclement weather and earthquakes. These claim causes will hit any project whatever the size of that project. No project is secure from these causes, and there is no direct relationship between the projects being small and the type or intensity of such claim cause. These claims come as a reaction by the affected party to the project due to these forces. All sizes of projects will be subjected to such claim causes and no project size is immune to such forces. The data analysis also showed that the small sized projects did not influence the man-made group of claims. Such group of claims contain such claims as war, strikes, fire, pollution and change in legislation. All these causes of claims are independent of

the size of the project and are all caused by third parties. These causes will be associated with any size of project, and in fact some of these causes will affect the construction industry environment as a whole and will even affect the general environment of the country. The data also showed that the small sized projects did not influence the site condition group of claims. Such a group contains claims such as limited access to the site, unpredictable subsurface conditions, historical ruins or cemetery found on site and disputed site ownership. The claim on limited access to the site will not be influenced by small size projects as this cause of claim will happen to any project irrespective of size. The claim on unpredictable subsurface conditions depends on the site selection and is not dependent on the small size of the project. It will happen in any size of a project. The same applies to the claim on historical ruins or cemetery found on site. The claim on disputed site ownership is generally caused by third parties and is independent of the size of the project, whether small or large. It was also seen from the analysis of data that small size projects did not influence the market driven group of claims. The claim causes of inflation of costs, currency fluctuations and shortage of basic resources or services are all dependent on the economic environment of the country. These forces will influence the construction industry environment, which in turn will influence any project whatever its size may be.

### 7.3.1) Influence on the Contract Administration group of Claims

The data shows that the sub hypothesis that the size of the project has no influence on the type of claim in the contract administration group of claims was rejected, which means that the size of the project does influence the contract administration group of claims, although the main hypothesis that the size of the project has no influence on the type of the

claim was accepted due to the acceptance of four out of six sub-hypothesis. The rejection of two sub-hypotheses did not change the overall acceptance of the main hypothesis. It is clear that the nearer the parties to the project are to the type of claim, the more influence they will have on it, and the more distant they are from the type of claim (as in Acts of God or man-made claims for example) the less influence they will have on the type of claim. The claim on poor coordination between contractors will be influenced by small projects if the main contractor selected for the job were unable to manage the contractors due to that he was unqualified. Small private owners will usually choose least bidders and might choose the wrong contractor for the job. There is no prequalification for the contractors in small jobs in the government sector (under five million Riyals), and there is no such prequalification in the private sector, which gives the chance that an unqualified contractor is awarded a contract and fails in managing his subcontractors. If the owner were to manage those contractors in his project, there is the possibility of this small owner being unqualified for such a job and only decided to go into this management job to cut costs. If the consultant were to manage these contractors and showed poor coordination between them, the possibility is that he was chosen on the lowest bidder basis or that the owner is unqualified to monitor his consultant's work. The delayed payment by owner will be influenced by the small project size if the owner is not financially strong or if he was managing his project himself and was not very successful in that aspect. An unqualified consultant will add to the problem and not process the payments in time. The claim on delayed handover of site to contractor will be influenced by the small project size if the small owner, who is usually unqualified for such management, was managing his project, thus causing delay in site handover to the contractor. The same might apply to an unqualified, low

paid consultant. The above argument will be applicable to the claim on stoppage of work by the owner. Small owners in the private sector are usually unaware of the damage their decision of stoppage of work will have on the contractor. They might stop the work several times during the construction period, sometimes for not having enough financing, and others for delay in approval of material or any other cause that is related to poor management of the project. Small government projects could be stopped as per the contract if there is much defective work by the contractor. This is more likely here since small government projects are constructed by contractors who do not have to pre qualify to be eligible to bid for small projects under five million Riyals. The claim on dispute on reimbursement of owner caused delay or owner-directed acceleration will also be influenced by small sized projects. As previously discussed, most private small owners are unaware of the consequences of their decisions, that might delay the project, on the contractor's financial position. The same applies to owner directed acceleration where small owners do not understand the details of such directions and the effect it will have on the cost of doing the work. The government as owner of small projects does not usually agree on any extension of ***time*** due to delay by its acts or omissions, not to mention any financial compensation to the contractor. The same applies to its direction of acceleration, which is usually ordered with no compensation to the contractor who might take the matter to court later to prove his rights. The claim on dispute on reasonable **time** extension will be influenced by the small size of a project. The discussion mentioned earlier on small owners managing their projects is also applicable here, as most small owners do not have the necessary tools to manage ***time*** extension claims. Small consultants might lack the same. Contractors in small private projects will lack the necessary mechanism to deal with such claims. The same might apply to claims on disputes on

reasonable market value of variation orders. The claim on variation orders being given in an untimely way will also be influenced by small sized projects. Some small projects will have been poorly designed by unqualified designers, which will result in too many variations needed, coupled with unprofessional management by owners or consultants will result in untimely variation orders. The claim on variation orders not a paid on time will be influenced by the small size of projects. Small private owners will not always be financially strong, thus delaying payments of variation orders. Small projects will employ small contractors, who will, in most cases, receive down payments without submitting a bank guarantee. In such a case, owners will want to delay payments of variation orders in order to make sure they will easily get back their down payments. Delayed payments in government projects are quite common irrespective of size. The claim on variation orders being too many will be due to that some government projects are constructed to a prototype design, which in some areas and sites might need many variation orders in order to fit the local conditions. In private small projects, owners will not be aware of all details in the design drawings, and might not put enough effort during the preliminary phase of the project to convey their needs to the designer, leaving this to a later stage during construction. The contractor will be faced by the fact that the owner disagrees with many of the details in the drawings and wants many changes. Some small projects are designed cheaply with the owner's intention to do all the necessary changes on site during the construction phase. The claim on the consultant being uncooperative will be influenced by the small size of the project. Small owners might have the belief that the less cooperative the consultant might be to the contractor, the more honest he will be to the owner and that this is a sign of professional conduct. Some small consultants have the same belief. This

will result in tension between the contractor and the consultant, but small owners rarely understand the negative **impact** this will have on their projects. The claim on poor documentation will be influenced by the small size of a project. If the small owner was managing his project, he might be unable to deal with the documents professionally due to his lack of experience or due to lack of basic knowledge of management. The same might apply to a consultant who is unqualified or inexperienced, which is the case at some small projects. The poor documentation will be due to an inexperienced contractor, or one who is only concerned with work on site and pays no attention to administrative work. The claim on that the contract does not specify the dispute resolution method will sure be influenced by the small projects. In such small projects some owners draft their own contracts and the possibility of not including such clauses is quite high. Small contractors too, might not be aware of such missing clauses, especially that they do not have to prequalify or be certified by any body or society. Some small unqualified consultants might not notice the discrepancies in the contract or the missing clauses. The small government projects all have these clauses, so this is not applicable to small government projects. The claim on contract documents being ambiguous, incomplete or contradictory will be influenced by the small size project. These documents will have been prepared by some small unqualified consultant who might have been selected for being a low fee consultant. Small owners might not also give enough ***time*** to the consultant to finish preparing these documents, which will result in the previously mentioned discrepancies in the contract documents. The same applies to small government projects. The claim that the project duration is not enough will be influenced by small size projects. The non professional way in which some small projects are managed will result in either the owner or the consultant specifies an unrealistic project duration

in the contract. It is very common among small less educated owners that they request the minimum of ***time*** to receive their projects, not knowing the negative effect this will have on ***quality***, cost, ***life expectancy*** and ***function*** of the project. Some consultants in these small projects might not give the proper advice to their clients. Some small contractors too, would try to win a bid by suggesting unrealistic construction durations. This claim is not common in government projects, where durations are more professionally dealt with. The claim on nominated sub-contractors will be influenced by the small size of projects. Small private owners will some times nominate a subcontractor introduced to them by a friend or relative, without making sure of his competence. Some small contractors working for these small projects are not known for their proficiency in management, which will make things worse with sub-contractors as a whole and the nominated sub-contractors in particular. This does not apply to government projects, where the policy is not to favour anyone by nominating him as a supplier or sub-contractor.

### 7.3.2) Influence on the 'Information-based' claim group

The data shows that the sub-hypothesis that the size of the project has no influence on the type of the claim in the 'technical and information based' group of claims was rejected, which means that the size of the project does have an influence on the type of the claim in the 'technical and information–based' group of claims, although the main hypothesis that the size of project has no influence on the type of claim was accepted due to the acceptance of four out of six sub- hypotheses. The rejection of two sub- hypotheses did not influence the overall acceptance of the main hypothesis. We can deduct that the nearer the parties to the project are to the type of claim, the more influence they have on it, and the more distant they are from the type of claim (as in 'market driven' causes of claim) the

less influence they will have on the type of claim. The claim on construction defects by the contractor will be influenced by the small size of a project. Some small projects are constructed by unprofessional contractors who are less experienced than others are and could easily make errors on site. Hundreds of new contractors get their registration by the Ministry of Commerce every year in Saudi Arabia. Only a small portion of these gets prequalified by the Ministry of Public Works and Housing. Most of the others, with no previous experience will get into the market to try their luck. There are no conditions of previous experience or even employing an engineer in order to be registered as a contractor. From the previous discussion, we can understand how easy it is for any contractor to make construction defects. If this were to be coupled with a weak consultant who is underpaid, the problem will be obvious. The same discussion is applicable to government small projects where selection techniques do not guarantee the right contractor for the job, and any new inexperienced contractor can apply for construction projects under five million Riyals. The same discussion is also applicable to the claim on poor materials used or supplied by the contractor and the claim on poor workmanship or ***quality*** of work. The consequences of the selection based on the least bidder is the one most important issue to be looked at by the Saudi professionals and decision makers, in order to minimize the low ***quality*** work and the initiation of claims in the construction industry. The same applies to small government projects. The claim on poor skills of the technical staff of contractor, owner, or consultant will also be influenced by the small size of projects. It is common for small private projects to have lowest bidders as contractors. This will undoubtedly have an effect on the technical standard of the contractor' staff. Few owners or consultants will ever discuss the qualification of the contractor's technical staff. Private sector contractors working on small projects might employ

low-paid technicians and technical staff in order to keep their overheads to a minimum. The standards of education in some third world countries, from which some contractors would recruit their staff, are not recognized as graduating high standard engineers or technicians. If the claim was due to owners' poor technical staff, it will be due to small owners being less experienced with management issues and might not know how to employ the necessary expertise. They will also try to keep their overheads as low as possible. If the claim was due to the poor skills of the technical staff of the consultant, this will be due to choosing the wrong consultant for the job, or selecting the least bidder. No doubt, a consultant who takes his fees down to a dangerous level will try to employ low paid personnel, who will be technically poor. In government projects, contractors are asked to present their staff's credentials before work on site begins, but rarely will a government agency reject any of a contractor's technical staff. This will surely lead to claims built on the poor technical skills of the contractor. The same thing applies to the consultant's personnel working on government projects. The same previous discussion is applicable to the claim on poor management by the contractor's staff. Many small contractors are not aware of the importance of management in a construction project. They put great weight on performing the work on site, and give the least attention to management on site or in the head office. The claim on the project being under priced will as well be influenced by small sized projects. Owners of small private projects do not usually use scientific approaches for determining the average price of constructing a project. They might not implement the right selection techniques. Moreover, they would go shopping for the cheapest prices and try to negotiate a discount with the least bidder. Some small consultants might not give the necessary advice on this matter to their clients. Many newcomers to the construction industry, working as

contractors, try to attract customers by taking their prices down. This would affect the ***quality*** and ***function*** of the project. Many of these contractors end up in court with their clients. Small government projects have the same problem of new contractors trying to enter the market, while not being asked for any prequalification or certification by any government or professional body. The claim on dispute on percentage or cost of items added or deleted from the bills of quantities will be influenced by the small size project. Small private projects might have poorly written contracts that do not cover these points of addition or deletion of work. Some small private owners who manage their projects by themselves have no idea of dealing with such disputes during the construction phase. There are no price indices or other approved guidelines to help in settling such disputes. Small government contracts have clauses addressing such additions or deletions, and most government contracts are on the remeasurement model, which makes such matters easy to deal with. There are no provisions for prices of items that might be added to a project, and there are no price indices to help with settling these disputes. The only way used in government is to negotiate the prices with the contractor, and if no agreement were made, the consultant would suggest the price of new items. The claim on delay in approval of drawings, schedules, material, work done, measured quantities or tests will also be influenced by the small size project. If the small owner were managing his project himself, this will lead to this delay in approvals due to the small owner being unprofessional and might not clearly understand the urgency of such matters and its **impact** on the project duration and the contractor's costs and profit. If the delay were due to the consultant, it will be due to weakness of this consultant, shortage of personnel at his team, or poor management. Small private projects usually employ small size consultants and these might be selected as the least bidders, thus

showing such weakness in dealing with approvals. It will be the same with small government projects too in relation to consultants. If the delay were due to the government agency itself as owner, this will be due to the big workload on government employees, shortage of personnel or the centralised approach in management that is adopted by the government. The claim on the code not being specified will be influenced by small size projects as well. Sometimes very little attention is given to drafting contracts in small size private projects. This will lead to that the code is not specified in the contract documents. Some unprofessional private owners know nothing about this issue, and they might not get the necessary advice from their consultants, who in some small private projects are selected on the least bidder basis, thus not necessarily being the best choice for this project. Some small private project contracts will specify some ambiguous words such as the best practice or the best standards. These words have been known to lead to disputes. Small government projects do not suffer from this matter as all government contracts specify the Saudi Code as the required one. Although this code does not cover all construction items, yet it is better than not specifying it at all. In practice, government personnel will ask contractors to use the American code (ASTM) for items not covered by the Saudi Code. The claim that the specifications are unclear, contradictory or incomplete will as well be influenced by the small size project. If small private owners choose the wrong consultant for the project, he will produce such defective specifications. The same will apply to consultants selected based on the lowest bidder, who will be technically weak. The same will happen if the owner did not give sufficient ***time*** to the consultant to produce these documents. The same applies to government projects when awarded to the wrong consultant. This will also happen when the government agency does not review the documents produced by the

consultant for checking. The delay in submittal of drawings by owner, consultant or contractor will also be influenced by the small size project. The small private owner will not be quite competent to produce such drawings and will, due to his weakness in management, delay the submittal of the drawings. In small government projects, the delay will be due to shortage of staff or work overload. If the consultant delayed in submitting the drawings, this will be due to weakness in his management and that he is not quite professional in conducting his work. The owner, either private or government, might not be monitoring the consultant's performance, thus making possible this delay. If the delay in submittal of drawings was due to the contractor, this will be due to his weakness in the technical aspects, or due to poor management at his head office. The same argument applies to the claim on poor submittals by contractor of shop drawings, as-built drawings or schedules. Poor performance by some contractors in small projects is due to the selection based on the least bidder and with no prequalification. Poor performance will be in technical or managerial aspects of the work and is true in both government and private small projects. The claim that the original design is incompatible with capabilities of local contractors/ suppliers or manufacturers is not applicable here due to most small projects being designed by local designers and thus will take the local environment of the construction industry into account. This is true with government or private small projects. The previous discussions are applicable here to the claim on that design drawings have errors, are contradictory or incomplete. The same problems will arise from selecting the wrong consultant, not paying him the sufficient fees or not giving him the necessary ***time*** to produce the correct design drawings. It is the same in government or private small projects, while not monitoring the consultant's performance by owner will add to this problem. The claim

on great differences between original and actual quantities will be influenced by small size projects in that small owners will not give enough attention to the design phase, especially first ***time*** homeowners. This will force the owner to give variation orders to make for the missing items. This claim will be due to the wrong quantity takeoff made by the designer or to the missing information from the site, or due to poor coordination between information from the site and the head office of the designer. Government small projects do not have this problem because almost all their contracts are built on the remeasurement model, so the problem of the great differences between original and actual quantities will not hurt the contractor as much as it will in lump sum contracts used in the private sector.

### 7.3.3) Discussion of the influence of medium and large sizes of the project on the type of claim

In discussing the size of a project, medium and large sizes were grouped together, as no significant difference is seen between the two sizes. Small size projects were earlier discussed, and here the medium and large projects will be collectively referred to as large projects. As discussed earlier, the main hypothesis that the size of a project has no influence on the type of claim was accepted. The same applies here to large projects, which will be discussed here in detail. Six-sub hypotheses were checked against the results of the analysis. Four-sub hypotheses were accepted and two were rejected. It was seen from the analysis that large size projects did not influence the Acts of God claims, which contain such claims as typhoons, floods, inclement weather and earthquakes. These claim causes will hit any project whatever the size of that project. No project is secure from these causes, and there is no direct relationship between the projects being large and the type or intensity of

such claim cause. Such claims usually come as a reaction by the affected party to the project due to these forces. Any size of project will be subjected to such claim causes, and no project size is safe from such forces. The data analysis also showed that the large sized projects did not influence the man-made group of claims. Such group of claims contains claims as war, strikes, fire, pollution and change in legislation. All these causes of claims are independent of the size of the project and are all caused by third parties, whether local or foreign. These causes will be associated with any size of project, and some of these causes will affect the whole construction industry environment, and will affect the general environment of the country. The data also showed that the large sized projects did not influence the site condition group of claims. This group contains claims as limited access to the site, unpredictable subsurface conditions, historical ruins or cemetery found on site and disputed site ownership. The claim on limited access to the site will not be influenced by large size projects as this cause of claim might happen to any project size. The claim on unpredictable subsurface conditions is dependent on the site selection, but is not dependent on the large size of the project, and will happen to any project irrespective of size. The same applies to the claim on historical ruins or cemetery found on site. The claim on disputed site ownership is generally caused by third parties, and is independent of the size of the project, whether large or small. The data also showed, after the analysis, that large size projects did not influence the market driven group of claims. The claims in this group are mostly dependent on the economic environment in the country. These claim causes are the inflation of costs, currency fluctuations and shortage of basic resources or services. The forces driving these claim causes will influence the industry environment as a whole, which in turn will be associated with any project, whatever its size may be. The data shows that the sub-hypothesis

that the size of the project has no influence on the type of claim in the contract administration group of claims was rejected, which means that the size of the project does influence the contract administration group of claims, although the main hypothesis that the size of the project has no influence on the type of the claim was accepted due to the acceptance of four out of six sub-hypotheses. The rejection of two sub-hypotheses did not change the overall acceptance of the main hypotheses. It is clear that the nearer the parties to the project are to the type of claim, the more influence they will have on it, and the more distant they are from the type of claim (as in Acts of God or man-made claims) the less influence they will have on the type of claim. The claim for poor coordination between contractors will be influenced by large projects if the main contractor selected for the job were unable to manage the sub contractors due to that he was not qualified for the job. Some private owners will choose to award a contract to a contractor for a large job without properly pre-qualifying him. Although contractors are prequalified for government projects exceeding five million Riyals, yet the procedure of selecting the least bidder could still award a contract to a weak contractor who will mess up managing his sub contractors. Some private owners will sometimes manage their projects themselves, without being fit for that and lacking the necessary expertise and technical staff. The result will undoubtedly show incompetence in managing the multiple or sub contractors. If the owner to a large project asked his consultant to manage those contractors and he failed in doing so, the possibility is that this consultant was selected on the least bidder method, thus lacking the necessary technical and managerial capabilities to run the job efficiently. The delayed payment by owner will be influenced by large projects if the private owner was not financially strong or was managing his project by himself and was unsuccessful in this aspect. An incompetent consultant

will add to this problem by not processing the payments on time. The claim on delayed handover of site to the contractor will be influenced by the large size of a project. More parties, private or public, could be involved in large projects, such as roads, high ways, airports and the like, which will delay the handing over of the site to the contractor. Sometimes unavailability of adequate funding will affect this claim cause. The involvement of several parties in large projects will additionally affect the claim on stoppage of work by owner, if he had to do so to resolve intersecting rights and involvements to the project. Some large public projects will stop due to lack of funding. This will also happen in private projects with inexperienced owners. Stoppage by the owner will happen in large projects, due to bad management practices either by the owner or by the consultant, as in late approvals of materials or drawings. Many owners in the local Saudi construction industry do not understand the negative effect this stoppage has on the cost and ***time*** factors, and many cases in the courts are partially or completely built on these incidents. The claims on the dispute on reimbursement of owner caused delay or owner-directed acceleration will as well be influenced by large projects. The claimed sums in large projects will be proportionate to the contract value, and this will force the public owners to reject the claim, as the government agencies rarely admit their responsibility in any delay to the contractor, and the larger the claimed amount, the more the government agency will deny its responsibility in the delay. The same is applicable with claims on disputed reimbursement due to owner-directed acceleration. The government will usually give these directed accelerations without any compensation, where most contractors will have to go to court to get their compensation. Some public projects are of high priority and are related to the pilgrimage season (Haj), where the government agencies might be the cause of delay, but will nevertheless

issue directions of acceleration to the contractor to finish on time, without granting him any rights of compensation and asking him, if he claims for compensation, to finish the job and go to court later. The same will apply to private projects. The claim on disputed reasonable ***time*** extension will be influenced by the large size of a project. Large projects will usually have several causes of delay that are due to different causes and caused by more than one party. This complicates the study of ***time*** extension by the owner or his consultant. This will lead to a dispute on this matter. Government agencies in Saudi Arabia are known to mostly deny contractors any ***time*** extensions, and in the case of large projects, ***time*** extensions asked by contractors could be long, which complicates the matter further. A well prepared claim on ***time*** extensions built on critical path method (CPM) schedules will rarely find the necessary personnel at the owner's or consultant's management team to review it and comment on it. This procedure of using CPM techniques to prove ***time*** extensions is not widespread in the Saudi construction industry. The usual method is to present the necessary documents (mainly of correspondence) and then negotiate to get an extension of ***time***. The larger the project the more likely it will have more variation orders. This is why the dispute on reasonable market value of variation orders will be influenced by larger sized projects. In addition, large projects will involve some imported items which will complicate the settlement of dispute about the reasonable market value for such change orders. The absence of price indices or published material or machinery costs in the Saudi market will surely aggravate this matter. The dispute over untimely variation orders will be influenced by large projects if the management, by either owner or consultant, is not up to the size of the project. The slow beauraucratic style of the government will add to this problem. In one incident, untimely variation orders were given in a hospital project worth three

hundred million Riyals without any ***time*** extensions, although the total value of the variation orders exceeded 20% of the contract value and were given after 80% of the project ***time*** has elapsed. In some vital projects, some high ranking government officials would like to have their input to the project, thus interfering in some decisions, sometimes late in the project's construction period, thus creating such untimely variation orders. The claim on variation orders not being paid on time will be influenced by the large size of projects if these amount to a big sum of ***money*** for which no budget had been assigned. Late payments by owners has been seen earlier as the major cause of claim in the Saudi construction industry, and following that, late payment of variation orders is not a surprise here. The Public Works Contract used in government projects states that, all variation orders are to be paid with the final payment, in order to make sure all negative variation orders are calculated as well before paying any sums to the contractor. Some private owners adopt the same policy, and some of them will delay payments of variation orders and use it as a tool to put pressure on the contractor if he were late, or to retain the ***money*** as a guarantee for advance payments not covered by a bank guarantee by the contractor, which is not a rare thing to happen in the private projects sector of the Saudi construction industry. The claim on too many variation orders will be influenced by the large size of projects if a prototype design is being used in government projects. Schools, hospitals, prisons and other public projects are built in several areas of the country to a prototype design. Taking in consideration the vast area of the country (over two million square kilometres) with different topographic and climatic regions, their will be a great need to give change orders to accommodate for such large variations. Some public buildings facing cuts on their budgets due to economic needs will face many negative variation orders. Some private owners, who build

large projects sometimes manage their projects themselves, without having the necessary expertise to do so, thus changing their minds a lot during the construction stage and giving too many variation orders to their contractor. Some private owners will not put enough effort during the design stage to convey their full requirements to the designer, and postponing their effort to the construction stage, thus facing design drawings that are not quite matching to their needs. They will have underpaid their designer or have not given him adequate ***time*** to finalize his job, thus producing a set of drawings that needs many changes to conform with the owner's needs. The claim on that the consultant is uncooperative will be influenced by large sized projects. The larger the project the more likely the stronger the contractor will be, and the more complicated the project will be. This will push the owners to ask the consultant to be harsh on the contractor in order to push up for the gap in technical and/or management standard between the owner and contractor. If the consultant too is weaker than the contractor is, this will make the consultant to be uncooperative with the contractor in order to bridge this gap and to conceal this fact from the owner. Government agencies ask consultants to work as their representative and not work as an independent professional. This forces consultants in government projects to take sides with the owner against the contractor throughout the construction phase. The larger or more complicated the project will be, the more uncooperative the consultant might be towards the contractor. Rarely will large private owners be happy with a consultant who is fully cooperative with the contractor. This is obviously a cultural problem. The claim on poor documentation will be influenced by large sized projects if the selected contractor was of poor administrative skills and not quite suitable for a large job. The larger the project the more documents there will be and the more organized should the contractor be. The private

sector has no standard selection criteria, thus giving the way for contractors with poor management skills to be awarded large projects. The subject of management skills is not one of the selection criteria in public projects, thus some contractors working on large projects will show poor documentation skills. Some government agencies have poor documentation procedures as well, and many cases have been lost in court due to this shortage. The claim on that the contract does not specify the dispute resolution method will be influenced by large sized projects. Government projects all have the resolution of disputes clauses in their contracts, but this is more likely to happen in private projects where owners draft the contracts themselves. Even in large projects, some owners will still not use the standard forms of contract. Some contractors too, working on large projects, will either draft the contract themselves or not notice the absence of such dispute resolution clauses in the contract prepared by the owner. The claim on contract documents being ambiguous, contradictory or incomplete will be influenced by large sized projects. If the owner selects the wrong consultant to do the job, this will surely be evident. The larger the project, the more discrepancies there will be in the documents prepared by a weak consultant. Large projects will always need longer ***time*** to prepare their contract documents, so if the owner to a large project does not give sufficient ***time*** to the consultant to prepare a high standard set of documents, we must expect the worst. Some large projects are complicated and need highly specialized consultants, and if these were not hired, we can expect many discrepancies in the contract documents. The claim on project specified duration being not enough will be influenced by large sized projects, as in Haj related projects, which should be completed before the Haj season, irrespective of the dates these projects start. The same applies to projects in the private sector such as hotels or guesthouses. Some less educated

private owners will ask for unrealistic project durations in order to use their facilities as early as possible, especially revenue generating projects. Some consultants will not discuss this with the owners, thus adding to the problem. The claim on nominated sub contractor will be influenced by the large sized project. The larger the project, the more specialized sub contractors there will be. Private owners of large projects will then have the choice to choose one or more nominated sub contractors to work on their projects. This will increase the possibility of having claims built on nominated sub contractors. Some private owners will sometimes choose a weak contractor who will not have the necessary managerial skills to work with a nominated subcontractor, thus laying the foundation for such claims to rise. Government projects do not suffer from this type of claim as public contracts and policy prohibit nominating any subcontractor or supplier in order not to favour anyone in particular. The data shows that the influence on the type of the claim in the technical and information based group of claims was rejected, which means that the size of the project does have an influence on the type of the claim in the technical and information-based group of claims, although the main hypothesis that the size of project has no influence on the type of the claim was accepted due to the acceptance of four out of six sub hypothesis. The rejection of two sub-hypothesis did not influence the overall acceptance of the main hypothesis. We can deduct that the nearer the parties are to the type of claim, the more influence they have on it, and the more distant they are from the type of claim (as in market driven causes of claim) the less influence they will have on the type of claim. The claim on construction defects by contractor will be influenced by large projects if the wrong contractor were selected for the job. The larger the project, the more defected work by a weak contractor there will be. Some large projects are also complex, and that gives a higher possibility that the wrong contractor

will make more defective work on site. In the private sector there are no standard selection techniques, and the owner could easily select the wrong contractor for his large project, with the possibility of the latter doing lots of defective work. If coupled with a weak consultant, this choice will be catastrophic. The same will be applicable to claims on poor material supplied or used by the contractor, and claims on poor workmanship or ***quality*** of work. The larger the project, the more labour it will need, and due to the complexity of the foreign labour issue in the Saudi market, a contractor might import labour from different countries with different levels of proficiency and this will have a negative **impact** on the work on site. Some countries do not have any bodies to train, register or follow up on their labour force. Unfortunately, the Saudi government does not restrict importing labour to good ***quality*** producing countries, but rather this matter is left to economic and political issues and conditions. The claim on poor technical skills of staffs of contractor, owner or consultant will be influenced by the big size of a project in the private sector where contractors are not necessarily prequalified and some large projects are awarded to less qualified contractors. Such large private owners who would select an unqualified contractor with poor skills of technical staff will themselves have poorly skilled technical staff manage the project. Although contractors are pre-qualified for large projects in the public sector, yet the least bidder selection criteria will end up awarding large contracts to contractors with poorly skilled technical staff. Although the contractor has to submit his technical staff's credentials to the government agency before commencing work on site, yet rarely will an agency reject any of them because the contractor is obliged, as per contract, to perform all work to a high standard and to the satisfaction of the consultant, thus he is responsible to provide the necessary technical staff, and the check of credentials by the government agency is just a

superficial act. The same will apply to a consultant selected through the least bidder method. Over 80% of the technical staff working in the Saudi construction industry is expatriates coming from ninety countries around the world. Most of those coming from developing countries have no license or certification from a reputable society or agency to work in his field. The standards of education and training in these countries are not the same and are far below those in developed countries. All this will result in the dumping of all kinds of technical standards and training experiences into the Saudi construction industry on which claims around poor skills of the technical staff will be built. The same argument will apply to the claim on poor management by contractor. There are some excellent contractors in the local construction industry, but the majority, even those working on large projects, have poor management on their sites and head offices. The general culture between these consultants is that the most important issue is to perform the work on site as per specifications and on time. Management issues are not a top priority with these contractors. That is why poor management by contractors has rated high among the twelve highest claim causes in this research. The claim on the project being under priced will be influenced by larger sized projects. During the boom years, most contractors had enough jobs to keep them busy. After the boom was over many contractors left the industry but those who stayed did not have enough work to satisfy them. Some of these, although working on large projects, took their prices down, sometimes to a dangerous level. Most of them were struggling for survival. The recession that followed the Second Gulf War (1991) made things worse for these contractors. The government, as owner, would not mind having the lowest bids after a fierce competition; even though all prices are catastrophic, the policy of the Ministry of Finance is that any discount to the reasonable project price is quite welcome as long as there

are bank guarantees to cover the default by the contractor. This policy had a catastrophic effect on the construction industry and one ministry had in the late nineties some six hundred projects either that were abandoned by contractors, or that the contractors were kicked out by the Ministry. Most of these projects were a direct effect of the Finance Ministry's policy. The claim on dispute over percentage or cost of items added or deleted from the contract will be influenced by large projects. The government contract used for large projects is the same one used in small projects. It lacks any provisional prices of items that might be added to the project, and the only way to settle that is by negotiation. If the contractor were not happy, then the consultant would decide on the price of any added item. If the contractor were still not convinced, he could take his claim to court. The Public Works Contract used for small and large projects states that there could be an addition of 10% to the contract value through variation orders or an omission of 15% through the deletion of certain work. There is still an argument going on whether these percentages are per each item in the bills of quantities or that they could be in one sole item, for instance making all the deletion of 15% from the concrete item alone. The dispute on this matter still goes on. Large private projects might use standard form contracts or might use any other contract form drafted by one of the parties. The latter most probably will not have a provision for added or deleted items and will not have provisional prices for added work, which will result in claims being initiated over this matter. In the absence of price and cost indices for the Saudi construction industry, this will add to the problem. The claim about delay in approval of drawings, schedules, material, work done, measured quantities or tests will be influenced by large sized projects. In large government projects, this will be due to the big work load on government employees or shortage of personnel in comparison to the work load. The government has stopped employing

new recruits in most ministries for financial reasons. It is sometimes employing temporary staff, but in many government agencies, there is a delay in processing matters. If the delay was due to the consultant it could be that, he was selected as the least bidder, thus not necessarily the most competent or the most suitable for the project. Some large projects in the private sector will be managed by the owners, who are not necessarily good at management. This will result in these claims being initiated on delay of approvals. The claim on that the code was not specified will be influenced by large projects in the private sector. Some private owners will hire least bidders as consultant, and this will not be very competent as to specify the necessary code in the contract documents. Some private owners are not aware of the necessity to include such information, and some of them, who prepare the contract documents themselves, even for large projects, will specify some general words such as the "best standards available". No doubt, these words will lead to claims and disputes. Large government projects specify the Saudi Code, and sometimes would refer to the American Code (ASTM) for items not covered yet by the Saudi Code, which is being worked on and not yet completed. The claim on specifications being unclear, contradictory or incomplete will as well be influenced by the large size project. If the designer were not given the adequate ***time*** to finish the large project, he will produce such discrepancies in his work. Some Haj related projects would suffer from the same. If some large private project owners chose to hire low charging consultants, either local or foreign (from developing countries), these will produce such contradictory or incomplete specifications, and not exerting any effort to review such work. The same will happen to large public projects. The delay in submittal of drawings by either owner, consultant or contractor will as well be influenced by the large size project. Some large private owners will try to manage their

projects by themselves or through their personnel and will, due to incompetence of their staff, delay the submittal of drawings to the contractor. Some owners will try to cut costs by doing these drawings in-house and not knowing the negative effect this will have on the contractor and the duration of the projects. This will rarely happen nowadays in public projects as most government agencies have given up doing any drawings in-house and have contracted that to consultants. If consultants were the ones to delay the submittal of drawings in a large project, the possibility is that the wrong consultant had been chosen for the job whose capabilities are not up to the project needs. The wrong consultant will also have been chosen under the lowest bidder method, which leaves us with the possibility of a low standard consultant who will not be capable of producing the necessary drawings on time. In large private projects there is no standard method of prequalifying or selecting contractors, so a weak contractor will be awarded a contract larger than he can manage, thus delaying the submittal of drawings to the owner or consultant. Such a situation will sometimes happen in public projects, too, through the least bidder selection technique. Under any condition, private and public owners should monitor their consultants' work to avoid or minimize this delay in drawing submittal. The same argument is applicable to the claim on poor submittals by contractor of shop drawings, as-built drawings and/or schedules. The least bidder selection technique used in public projects and the no prequalification of contractors in the private sector will lead to such consequences. The claim on that the original design is incompatible with capabilities of local contractors /suppliers or manufactures will be influenced by large projects. Some government agencies used to design its large projects abroad with international design firms. Some of these firms did not familiarize themselves with the local construction industry standards and will design projects that needed either

material, machinery or manpower from abroad to construct the project. The number of these internationally designed government projects has decreased a lot, especially that most large infrastructure projects have been completed and the Saudi design firms have accumulated enough experience to design large projects. The same applies to private owners of large projects. The claim on design drawings having errors, are contradictory or incomplete carries the same argument discussed above. Selecting the wrong consultant in the private sector or the lowest bidder in the public sector might lead to this claim. Moreover not giving the designer enough ***time*** to finish the job to a satisfactory standard, or underpaying him, will add to the problem. In any case, the lack of review or monitoring of the output of the designer by the public or private owner will lead to the same situation of discrepancies in the design drawings. The claim on big differences between original and actual quantities will be influenced by large size projects. Large private owners will hire an incompetent designer to produce the contract documents, whether local or foreign from developing countries. They might also underpay him, which will result in many defects in the quantity surveying. There are no quantity surveyors in Saudi Arabia, which adopts the American method of civil engineers doing the job of a quantity surveyor. If this problem is coupled with a lump sum contract to be awarded to a contractor, this will lead to such claims on large differences between original and actual quantities. Although it is the duty of the contractor in lump sum contracts to review the quantities and make sure about the correct quantities he is bidding for, yet some unprofessional contractors will take the bills of quantities as correct and bid for the job, just to find later the large differences between the original and actual quantities. The same will apply to government projects on a smaller scale. Most public contracts are on a re-measurement basis, which minimizes the risk for the

contractor, but there still could be a claim of this sort if the difference in quantities exceeds the 10% additional work permitted under the contract.

### 7.4) Hypothesis No. 4

**H4 : The project party has no influence on the association with the eight variables.**

This hypothesis was rejected by the results of the analysis made using the chi-square test and the proportion test and by the weighted associations. There were twelve sub-hypotheses rejected by the results of the analysis out of twenty-four sub-hypotheses, which gives a result of 50% rejected and that is enough to reject the fourth general hypothesis that the project party has no influence on the associations with the eight variables.

#### 7.4.1) Owners

It was seen from the data that owners did influence the ***time*** variable of a project. This will happen by the owners' actions or omissions. An owner will influence the ***time*** variable of a project by limiting the access of a contractor to the site, or giving incomplete information about the site to the contractor who might find unpredictable sub surface conditions that will affect the ***time*** of the project. If there is a dispute over the site between the owner and any third party, this will lead to the owner influencing the ***time*** variable until such disputes are resolved if they forced the contractor to slow down or even stop the work on site. If the owner was responsible to coordinate between several contractors and he was not up to the job, he will negatively influence the ***time*** variable. He will influence ***time*** claims as well by delaying payments to the contractors either interim payments or variation order payments too. The owner will also influence ***time*** claims by delaying the hand over of the site to the contractor or through stoppage of work (either once or several times)

contrary to what is stated in the contract. He will also influence ***time*** claims by causing delays of any kind to the contractor or giving direction for acceleration. If he denies the contractor the reasonable ***time*** extension or gives him untimely variation orders, the owner will then be influencing the ***time*** claims. Too many variation orders by the owner will give the same effect. If there were discrepancies in the contract documents prepared by the owner, or by a consultant he chose, this will influence the ***time*** claims as well. The owner will influence the ***time*** variable claims by specifying unreasonable project durations or even agreeing to such durations suggested by his consultant. The owner's nomination of an incompetent subcontractor will lead to the same result. He will also influence the ***time*** claim by employing poorly skilled technical staff to manage the project, which will lead to delays in approval of drawings, schedules, material, work done or tests. This team will delay submittal of drawings if they were responsible for that. By hiring the wrong consultant, the owner will influence the ***time*** claims through discrepancies in the design drawings, specifications or the contract documents as a whole. If he hired a foreign designer who has not familiarized himself with the local construction industry, the owner will influence the ***time*** claims by coming up with a design that is incompatible with the capabilities of local contractors / suppliers or manufacturers. It was seen from the data that owners did influence the ***money*** variable of a project. By limiting the access to the site for a contractor, the owner will influence a claim based on ***money*** in his project. He will also influence it by not giving the contractor the necessary site information and investigations, thus leading to a claim on ***money*** based on the difficulties the contractor will encounter during construction if he finds the sub-surface conditions distinctly different from what he has calculated in his bid. The owner will also influence the ***money***-based claims if the

ownership of the site was disputed with any third party. This will lead to stoppage or slowdown of work, which will generate claims on extra site overheads. The owner will, if he were coordinating the work between several contractors, influence the initiation of a ***money***-based claim against him by the contractor if the owner poorly coordinated the work between the contractors, thus affecting their overheads. The owner, by delaying payments to the contractor, will surely influence ***money*** claims by the contractor, and the same will apply if the owner delayed the site handover to the contractor, who will claim site overheads and other expenses. One contractor in the Central Region of Saudi Arabia claimed over a hundred million Riyals as site overheads and expenses when the government asked him to stop taking over the site, after he had mobilized, because of the governments wish to move the location of the project. The sewage treatment plant was later changed to another site fifteen months later. The original contract value was a hundred and fifty million Riyals. The owner will also influence ***money*** based claims through his stoppage of work for reasons other than stated in the contract. The contractor will incur an increase in his overheads for which he will claim. The same will happen when an owner gives directions of acceleration to the contractor, in which case the contractor will claim extra ***money*** due to the acceleration costs he will incur. The issue of variation orders will as well be a major cause of claims influenced by the owner if he gives untimely variation orders, gives a lot of them, or delays their payment. ***Money*** based claims will be generated by contractors against owners due to discrepancies in the contract documents. These will be influenced by owners if they were the ones preparing the contract documents. Any lack of information, ambiguity or contradiction in these documents will effect the cost of work or overheads of the contractor who will undoubtedly claim against these losses. Owners will also influence ***money*** based

claims by nominating the wrong subcontractor, thus giving the contractor a reason to claim from the owner any losses or delay due to this nominated subcontractor, The poor skills of the owner's staff is one other cause the owner will influence the ***money*** claims. If the contractor is negatively affected by this poor skilled staff, either through delay or through rework he had to do, this will be a base for a ***money*** claim by the contractor. The delay by the owner's staff of any approvals of drawings, schedules, material, work done, measured quantities or tests will be a cause of a ***money*** based claim by the contractor if this delayed approval influenced the ***time***, and consequently, the cost of overheads of the contractor. If the owner's staff was responsible for producing the specifications for the project and there were any discrepancies in them that led to rework or delay to the contractor's schedule, here the owner will influence a ***money***-based claim against him. The same will apply if the owner were to submit the drawings but he delayed them, and then the contractor, if affected by this delay, will claim ***money*** from the owner. Errors in design drawings or in quantity surveying, if were made by the owner's staff, will also be a basis for a ***money*** claim influenced by the owner. If the owner hired a foreign consultant who designed a project that was not compatible with the local capabilities of the contractor, supplier or manufacture this will be a base for a ***money*** claim influenced by the owner. It was seen from the data that owners did influence the ***operation*** of a project variable. By poor coordination between contractors, the owner will influence the ***quality*** and thus influence the claim on ***operation*** of a project. The same will happen through poor documentation by the owner who will influence ***operation*** by not providing the necessary work manuals, brochures and the like for a smooth ***operation*** of the project. The same influence by the owner will happen if the owner specified an unrealistic construction duration, which will affect the

***quality*** and ***operation*** of the facility. Again, the owner will influence the ***operation*** variable through nominating the wrong subcontractor, who will affect the ***quality*** and ***operation*** of a project, as with electromechanical sub contractors. The poor skills of the technical staff of the owner will lead to ***quality*** problems and subsequently ***operation*** problems. The owner will risk negative affects on ***quality*** and ***operation*** if he selected the contractor with the lowest bid and awarded him the contract knowing that the contract value was under priced. Ambiguous, contradictory or incomplete specifications produced by the owner's staff will risk the ***operation*** of the project through bad ***quality*** work. The same is applicable to design drawings produced by the owner, who will influence the ***quality*** and ***operation*** of his project by hiring a foreign designer who will produce a design incompatible with the local capabilities of contractors, suppliers and/or manufacturers. It was seen from the data that owners did not influence the ***quality*** variable in a project, or that their influence was insignificant. Owners will slightly influence the ***quality*** variable through their poor coordination of contractors, poorly prepared contract documents, specifications or design drawings if they were prepared by the owner's staff. Discrepancies in these documents will have a negative effect on ***quality*** ,thus giving grounds for claims on this variable. Owners will also influence claims on ***quality*** by designing their projects with foreign designers who are not familiar with the local construction industry standards. The data shows that if owners hired a foreign consultant who designed a project that was not compatible with the local capabilities of the contractor, supplier or manufacturer this will be a base for a ***money*** claim influenced by the owner. It was seen from the data that owners did influence the ***operation*** of a project variable. By poor coordination between contractors, owners will be associated with the ***quality*** variable through their poor coordination of contractors, poorly

prepared contract documents, specifications or design drawings, if they were prepared by the owner's staff. Discrepancies in these documents will have a negative effect on ***quality***, thus giving grounds for claims on this variable. Owners will also influence claims on ***quality*** by designing their projects with foreign designers who are not familiar with the local construction industry standards. The data shows that owners are not the major party to influence the ***quality*** claim, and that the other parties to the project have possibly more influence on this variable. The data shows that owners did not influence the ***function*** variable on a project or that their influence was insignificant. Poorly prepared design drawings, specifications or contract documents by the owner's staff will influence claims on ***function*** of a project. The same will happen if a foreign designer designed the project without familiarizing himself with the local culture of Saudi Arabia, where custom and heritage greatly influence how projects (especially buildings) are designed. It was shown from the data that owners did not influence the ***life expectancy*** variable of a project, or that their influence was minimal and insignificant. If the owner's staff produced poor contract documents, specifications or design drawings, this will influence the claim on ***life expectancy***, as well as when the design and specifications were made by a foreign consultant who did not know much about the local conditions in the country, especially about the high possibility of steel corrosion and concrete failure due to the extremely high humid weather on both the east and west coasts. ***Life expectancy*** will be influenced through directed acceleration by the owner. The data shows that owners did not influence the ***reputation*** of the parties' variable, or that it was an insignificant influence. By delaying payments, owners will influence this ***reputation*** variable as well as by choosing the wrong consultant, producing poorly prepared contract documents or repeatedly delaying approvals of drawings, schedules, material, work

done or tests. The data also shows that owners did not influence the ***future relations*** variable in a project, or that this influence was insignificant. Surely delayed payments by owner will influence this variable as well as not settling the claims on time, or going to court or arbitration to settle these claims.

### 7.4.2) Contractors

Concerning contractors, as the second party in a project after owners, it was seen from the data that they did influence the ***time*** variable of a project. This will be through their actions or omissions. A contactor will not do the necessary soil investigations before bidding, if that were required of him, or before mobilization, thus affecting the ***time*** variable if he found unknown difficulties underground. The same might happen through the contractor's poor coordination of other contractors or subcontractors. Construction defects by the contractor will lead to an association with time, if rework is required. The same is applicable to poor ***quality*** of work or poor workmanship by contractor and poor materials used or supplied by contractor. The poor skills of the technical staff of the contractor will yield to delays on site as well as poor management by contractor on site or in the head office. All that will influence the ***time*** variable and the ***time***–based claims. If the contractor entered into a contract that he new was illogically low priced, he will influence the ***time*** variable if he had to stop or slow down the work due to his financial problems arising out of the under priced contract. If the contractor gets into dispute with the owner over reasonable ***time*** extensions or payment of extra work or on cost or percentage of added or deleted items, and he either stops or slows down the work due to this dispute, then he will here be influencing the ***time*** factor. He will also be influencing the ***time*** variable if he delayed the submittal of necessary

drawings or poorly submitted the shop drawings, as-built drawings or schedules. He will also influence the ***time*** factor if he did not adequately review the contract documents to find any discrepancies early enough to avoid dispute over this issue that will influences the ***time*** variable. The same will apply to neglecting the review of original and actual quantities to look for any great differences in them if they were calculated by the consultant or even by the owner's staff. It was seen from the data that contractors did influence the ***money*** variable of a project. By not paying enough attention to the site investigations needed prior to bidding or to commencing work on site, the contractor will influence the ***money*** claim in a project. He will also do that through his poor coordination between the contractors, either several main contractors, for whom he was required by contract to manage or coordinate, or for his own subcontractors. This poor management will affect the ***time*** and subsequently the ***money*** variable in a project. Entering into a dispute that takes too long to resolve with the owner, will influence the ***money*** variable after it be associated with the ***time*** variable as well. These disputes will be over reimbursement of owner-caused delay, over owner-directed acceleration, dispute on reasonable ***time*** extension or on reasonable market value of variation orders. The contractor will influence the ***money*** claims too by not noticing that the contract did not specify the dispute resolution method. This will influencing the ***time*** variable which will at the end effect the ***money*** variable. If the specified construction duration is not enough and the contractor accepted that at first without raising this matter, he will thus be influencing the ***money*** variable and the initiation of ***money***-based claims through the effect this will have on the ***time*** variable. He will as well influence the ***money*** variable by accepting the owner's nomination of an unsuitable subcontractor. Any effect of this nominated subcontractor on the ***quality*** or ***time*** variables will

immediately be translated to an association with ***money***. Construction defects by the contractor will inevitably be associated with the ***money*** claims in a project, as well as poor material supplied or used by this contractor or any poor quality work or workmanship by him. The poor skills of the technical staff of the contractor or poor management by his team will have an influence on the ***money*** claims against him in a project. If a contractor accepted to be awarded a contract that is illogically under priced this will surely lead to ***money*** claims either by him or against him. The contract documents, specifications and design drawings are all causes for claims. If the contractor were to prepare and present them for a certain project (as in design build arrangements), he will be influencing ***money*** claims against himself by preparing incomplete or contradictory documents. If these documents were prepared either by the owner or the consultant, it will be the contractor's duty to review them and point out any discrepancies at an early stage. If he did not, then it will be himself who will influence the ***money*** claims prepared either by him or against him. The same influence on ***money*** claims will be influenced by a contractor if he delays his submittal of drawings or poorly submits either shop drawings, as built drawings or schedules. The influence of this delay or poor submittal will surly be associated with the ***time*** variable and in a chain reaction will be associated with the ***money*** variable. It was seen from the data that a contractor slightly influenced the ***operation*** of a project. His actions or omissions have a small association with the ***operation*** variable. He will do that through his poor documentation and if through this, important information for operating the project were not handed in to the ***operation*** team. If he were preparing the contract documents and they had discrepancies that will lead to an effect on operating this project, then he will be influencing the ***operation*** variable. The same will apply to poor workmanship, poor quality of work or poor

material used by the contractor. All these will influence the smooth ***operation*** of a project, and through the poor technical skills of the contractor's staff. Although there is some influence by the contractor to the ***operation*** variable, yet the data shows it is not a great one, and that contractors do not see themselves as influencing such a variable. The data shows that contractors do not think of themselves as influencing the ***quality*** variable in a project. It was seen from the data that the influence was a slight one. ***Quality*** will be influenced by contractors through their defective work, poor coordination between contractors or poor workmanship, ***quality*** or materials used in a project. Poor skills of the contractor's technical staff will certainly add to this influence. Poor preparation of the contract documents will be associated with the ***quality*** variable if they were prepared by the contractor. It was seen from the data that contractors did not see themselves as influencing the ***function*** of a project variable. Poor material supplied or used by the contractor will influence the ***function*** of a project. Poorly prepared contract documents including specifications and design drawings, if were prepared by the contractor, will add to this problem, and if the contractor hired a foreign designer to design the project who did not familiarize himself with the local culture, the same negative influence on the ***function*** of the project by the contractor will be evident. After all, the data showed a slight or insignificant influence by contractors on the ***function***-based claims in a project. The ***life expectancy*** variable of a project was seen from the data that contractors did not have influence on it or that this influence was insignificant. Contractors will influence this variable through their construction defects, poor materials, workmanship or ***quality*** of work. The same will happen through the poor technical skills of the contractor's staff. If the contractor were to prepare the contract documents including specifications and design drawings, he will influence the ***life expectancy***

variable of a project by poorly preparing these documents. If he hired a foreign designer who had no technical knowledge of the local construction industry and weather and soil conditions, this will also be a way in which this contractor influenced such ***life expectancy***–based claims in a project. The data shows that contractors do not influence the ***reputation*** of the parties' variable in a project, or that this influence is minimal. A contractor will influence his ***reputation*** through poor workmanship or ***quality***, defective work or poor material used by him. He will also influence this by claiming too much or on many occasions giving himself the ***reputation*** of a claiming contractor. He will also influence his ***reputation*** by his poor management or poor technical skills of his staff. He will do the same by being known to illogically taking his prices down, or by being always late in delivering his projects or submittals. The same will happen if he were to be known to produce defective contract documents, specifications or design drawings. It seems that contractors are unaware of their influence on the ***reputation*** variable. The data shows that the contractor's influence on the ***future relations*** of the parties is significant. A contractor will influence his ***future relations*** with an owner through claiming too much , not resolving his disputes with the owner in a short time, or going to court or arbitration to resolve these disputes. He will also do that through his defective work, poor workmanship, ***quality*** or materials used and through employing a poorly skilled staff. He will influence his ***future relations*** by his late submittals of drawings or late handing over of the completed project. The same will happen if he prepared poor contract documents including specifications and design drawings. The contractors are aware of their role and their influence on this variable.

### 7.4.3) Consultants

Concerning consultants, as the third party to a project after owners and contractors, it was seen from the data that they did influence the ***time*** variable of a project. If a consultant had to do anything with limiting the access to the site by the contractor, he will this way be influencing the ***time*** variable. He will influence it through insufficient soil investigations by which the contractor will face unanticipated subsurface conditions that will delay the work on site. If the consultant had the duty of coordination between several main contractors, or between several subcontractors, and he did a poor job in that aspect, he will surely be influencing the ***time*** variable. The delayed payments by owner could be due to the late check of work or payment certificates by the consultant, and this will influence the ***time*** variable. The same applies to late handover of the site, or parts of it, to the contractor. If the untimely variation orders were given late because of the consultant or that he gave too many of them, this will also lead to an association with the ***time*** factor. By being uncooperative in dealing with a contractor, the consultant will no doubt influence the ***time*** variable in a project. His poor documentation or poor skills of his staff will as well lead to the same results. If he were the one to prepare the contract documents and he did that poorly including the bills of quantities, specifications, design drawings and the contract form, he will inevitably cause some delay of the work until these discrepancies have been corrected. If the contract form he prepared did not specify the dispute resolution method this will have an association with the ***time*** factor until such ambiguity has been cleared. If the bills of quantities were not professionally prepared, there will be a large difference between original and actual quantities, which will cause some delay in the work until such a matter has been sorted out. If the consultant delayed the

approval of any thing submitted by the contractor, he will this way be influencing the ***time*** factor. Delay in approvals would be due to the design or as-built drawings, schedules, material, work done, measured quantities or tests. If the consultant nominated the wrong subcontractor, he will be this way causing a delay for the work. If the consultant delayed the submittal of drawings (either design or workshop drawings) he will this way be influencing the ***time*** variable. It is clear from the above discussion how far a consultant can go in influencing the ***time*** factor in a project. It was seen from the data that consultants influence the ***money*** variable as well in a project. This is a direct influence either on the ***money*** factor, or through influencing the ***time*** factor as discussed above. By limiting the access of the contractor to the site, the consultant will be associating the ***money*** factor due to the difficulties encountered by the contractor, and by not paying enough attention to the soil investigations he will influence the ***money*** claims initiated by the contractor due to the extra work and/or time he will need to perform the work. If the consultant were to coordinate the work between several contractors and he did that poorly, he will be influencing the ***time*** and ***money*** variables together. If the delayed payments were due to a delay by the consultant to approve the quantities, work done, tests or payment certificates, he will surely be influencing ***money*** claims initiated by the contractor against the owner for compensation due to late payments. The same will apply if the consultant caused the delay in handing over the site, or parts of it, to the contractor. If the latter incurred any damages due to that late site handover, the consultant will thus be influencing the ***money*** variable. Giving untimely variation orders, or too many of them could be due to the consultant, who will surely influence the ***time*** factor, and consequently the ***money*** factor as well. By being uncooperative to the contractor, the consultant will cause some hardships to him and therefore causing him to claim some

***money*** from the owner based on these hardships. If the consultant was preparing the contract documents and these were poorly prepared with lots of discrepancies in the design drawings, specifications, bills of quantities and the contract form, this will surely influence the ***money*** factor. If the quantities in the bills turned to be largely different from the actual quantities, this will cause the contractor to claim ***money*** from the owner, especially in lump sum contracts. A poorly chosen nominated subcontractor by the consultant will lead to ***money*** claims by the contractor who suffers from this sub contractor's weakness. Poor skills of the consultants' technical staff will be grounds for the contractor to claim ***money*** due to their acts or omissions. The delay in approval of any item submitted by the contractor will lead to the later claiming damages due to that delay. Delayed approvals by the consultant might be in design, workshop or as built drawings, schedules, material, work done, measured quantities or tests. The same effect will be due to delay in the consultant's submittal to the contractor of any drawings or information. The data shows that consultants do influence the claims based on ***operation***. The consultant's poor coordination between several contractors will lead to problems in the ***operation*** of a project. The variation orders that the consultant gives untimely will have an association with ***quality*** of work and thus influencing the ***operation*** of a project. If the consultant were uncooperative to the contractor, this will lead to defective work or ***quality*** problems that cause ***operation*** problems later. Poor documentation by the consultant will be the basis for operational problems if due to this poor documentation some information, necessary for the smooth ***operation*** of the project, was missing. Some ***operation***-based claims will be initiated due to the poorly prepared contract documents by the consultant, including design drawings, specifications and bills of quantities. The poor technical skills of the consultant's staff will have a negative effect on the

work and ***quality***, thus influencing the ***operation*** variable. It was seen from the data that consultants do influence the ***quality*** variable of a project. Poor coordination of the consultant between several contractors will lead to ***quality*** problems. Wrongly-timed variation orders issued by the consultant will also lead to ***quality*** problems. Being uncooperative to a contractor, the consultant will cause some ***quality*** problems here. Poorly prepared contract documents will generate ***quality*** claims. These include design drawings, specifications and bills of quantities. If the consultant nominated the wrong subcontractor, he will this way be influencing the ***quality*** factor through the bad ***quality*** of work this nominated sub contractor will produce. Surely, there will be some ***quality*** claims based on the poor skills of the consultant's technical staff. If the consultant joined in selecting the least bidder whose bid was illogically under priced, he will surely be influencing the generation of claims due to ***quality*** problems in this low priced bid. The consultant will influence the ***quality*** claims if he did not specify the necessary code in the contract documents prepared by him, or did not raise this issue with the owner if the contract documents were prepared by others. The data shows that consultants did not influence the ***function*** of a project variable, or that their influence was slight and insignificant. Poorly prepared contract documents will influence the ***function*** of a project if it contained discrepancies that affected the specifications and the design drawings. The same will apply if the consultant subcontracted the design to a foreign designer who was not aware of the cultural aspects affecting the design of such projects. It was shown from the data that consultants did not influence the ***life expectancy*** variable of a project or that their influence was insignificant. At least that is what they think of themselves. Poor coordination by the consultant between several contractors will have an association with the ***quality*** of the work and can be a threat to the ***life expectancy*** variable of a

project. If the untimely variation orders were given by the consultant and had an association on ***quality***, they will affect the ***life expectancy*** of a project. If due to that the consultant was un-cooperating with the contractor, some association was shown with ***quality*** issues; this too will have an association with the ***life expectancy*** variable. The contract documents prepared by the consultant, including specifications and design drawings will, if poorly prepared, have an association with the ***life expectancy*** of a project. The poor skills of the consultant's technical staff will have a negative association with ***quality*** and, subsequently, on ***life expectancy*** too. The poor submittal by consultant of information or drawings will also have the same negative effect, and if the consultant subcontracted the design work to a foreign designer who is not familiar with the local conditions and did not provide him with the necessary information on the weather and soil conditions, this will also association with the ***life expectancy*** variable in a project. The data shows that consultants do influence the ***reputation*** of the parties' variable in a project. A consultant will influence his ***reputation*** by repeatedly delaying payments to the contractor, giving too many untimely variation orders, or being uncooperative to the contractor. He will do the same through producing poorly prepared contract documents, including specifications, bills of quantities, design drawings and the contract form. Any discrepancies in these documents will shed a negative association with the consultant's ***reputation***. The same will happen if the consultant hires poorly skilled technical staff or usually delays his approvals of either drawings submitted by the contractor, schedules, material, measured quantities, work done or tests. He will negatively influence his own ***reputation*** by regularly delaying his submittal of drawings or information to the contractor. It was seen from the data that consultants did influence the claims thus having ***future relations*** of the project parties. Generally,

by doing a poor job, any consultant will influence his ***future relations*** with the project parties, especially the owner. If he were known to delay payments to the contractor this will risk his ***future relations*** with the owner and the contractor. If he persistently keeps himself uncooperative with the contractor, he will negatively influence his ***future relations*** with the contractor and, probably with the owner as well. If he produced poorly-prepared contract documents which had a negative influence on the work and on the management of the project, this will inevitably have a negative association with both the owner and, to a lesser degree, on the contractor in their ***future relations***. If he hires a poorly skilled staff or usually delays the approvals of submittals by the contractor, he will this way risk his ***future relations*** with the owner and the contractor as well. The same will happen if he delays his submittal of information or drawings to the contractor. The previous discussion shows how hard the consultant should work to keep his ***future relations*** with mainly the owner and to a lesser degree with the contractor.

## 7.5) Hypothesis No. 5

**H5 : The type of project ownership (government/private) is not associated with the eight variables.**

This hypothesis was rejected by the results of the analysis made using the chi square test and the proportion test and by the weighted weights of association. There were eight sub hypotheses rejected by the results of the analysis out of sixteen sub hypotheses, which gives a result of 50% rejection, and that is enough to reject the fifth general hypothesis that the type of project ownership has no influence on the eight variables.

### 7.5.1) Government Ownership

It was seen from the data that the government ownership did influence the ***time*** variable of a project. This will happen through the government's actions or omissions. Although the owner might be a government ministry or agency, yet the government as an entity will influence the ***time*** variable by declaring war or entering into a military ***operation***. Change in legislation will as well be an influence by the government on ***time*** of a project. Not necessarily all changes in legislation will be associated with the ***time*** variable in a project, but the possibility is there. By limiting the access to the site, or part of it, the government will surely be associated with the ***time*** variable. Projects like airbases, airports or other similar facilities will be good examples of limited access for a contractor. Disputed site ownerships will be a way the government will influence the ***time*** variable in a project. This is a possibility in rural areas where there is still some conflict between the tribes as to the ownership of land and between these tribes and the government as well. Another way in which the government as owner will

be associated with the ***time*** variable is by delaying payments to contractors, which has been the major concern in the construction industry after the second gulf war of 1991. Delaying the handing over of a site to a contractor, or part of it, will influence the ***time*** variable. Sometimes this is due to the big workload on the government agencies and the relaxed atmosphere of doing business in them. The wrong timing of giving variation orders will in most cases be associated with the ***time*** variable in a project, as well as not paying these variations on time and giving too many of them. The issue of the consultant being uncooperative to the contractor is another way the government as owner will influence the ***time*** variable. Government contracts with consultants put them as agents to the government agency, thus requiring them to work for this agency rather than independently and neutrally. Poor documentation in some of the government agencies will lead to an association with the ***time*** factor and will no doubt impact the pace at which these agencies would react to the needs of the project. If the government agency were to prepare the contract documents itself and there happened to be some discrepancies in these documents, this will surely be associated with ***time*** variable, which will also be associated with the government agency if it specified unrealistic construction durations. The poor skills of the technical staff of the government agency will lead to delays thus will influencing the ***time*** variable. The same will happen if the government, as owner, awarded a contract that was unrealistically under priced. The delay in approvals of shop or as-built drawings, schedules, materials or tests by the government staff is a major cause of delay to the project, thus be associated with the ***time*** variable. A contractor claimed almost 30% of the contract duration as an extension of time due to the delay in approvals by the government agency who owned the project, although it hired a consultant for the job, yet it required that all approvals be made through

it's staff. The delay in submittal of any drawing or information by the government agency will no doubt affect the ***time*** variable, which will as well be influenced by design drawings that the government has contracted to a foreign design firm that did not familiarize itself with the local construction industry capabilities and produced a design that was incompatible with the local capabilities of contractors, suppliers or manufacturers. The data showed that the government ownership did influence the ***money*** variable in a project. By starting war or getting in military action with another power, the government will influence the ***money*** factor. Changes in legislation as well will be associated with the ***money*** factor. Disputes over site ownership will also be associated with the ***time*** variable, as well as delayed payments, which is a great concern to contractors dealing with the government. The same will happen by delaying the site handover or part of it to the contractor, or through directed acceleration, which will influence the ***money*** and ***time*** variables together. The timing of variation orders will be associated with the ***money*** factor if these orders were given late in relation to each activity. This will need rework or acceleration or will negatively **impact** the productivity of workers. All these will be associated with the ***money*** factor. Giving too many variation orders will lead to the same conclusion. The uncooperative consultant to the contractor, who is encouraged to do so by the government agencies, will have a negative association with the ***time*** and ***money*** variables as well. Poor documentation by the government agencies will lead to a delay in response to the needs of the project and will be associated with the ***time***, and consequently, the ***money*** variable in a project. If the government agency was preparing the contract documents itself, including the design drawings, specifications, bills of quantities and the contract form, and any of the documents had discrepancies in it; this will surely be associated with the ***money*** factor and force the contractor to

claim for his losses due to the errors in these documents. The poor skills of the government's technical staff will undoubtedly be associated with the ***money*** variable through incompetence of dealing with the technical aspects of the project. If the government agency awarded a contract to a contractor that was under priced, it will surely influence the initiation of ***money***-based claims by that contractor. The delay in approval, by the government agency, of any submittals by the contractor, such as drawings, schedules, materials, quantities or tests, will cause the contractor to claim ***money*** from the government to compensate him for the delay it caused. The government will also influence the ***money*** factor by delaying its submittal of any drawings or information necessary for the smooth running of a project. The contractor will ask for ***money***-based claims if the design for a project that was designed by a foreign designer, is incompatible to the local industry's standards and capabilities. It was seen from the data that the government ownership did influence the ***operation*** of a project variable. The untimely variation orders or too many of them will be associated with the ***quality*** and consequently the ***operation*** variable of a project. The low cooperation consultant who is encouraged by the government will lead to problems of ***quality*** and in turn will lead to problems in ***operation***. Poor documentation by a government agency will be associated with the ***operation*** factor if important information was not properly documented and given to the ***operation*** team. Poorly prepared contract documents, including design drawings and specifications will lead to future problems in ***operation*** of the project. If the government agency specified unrealistic construction duration for a project, this will lead to ***quality*** and ***operation*** problems later. The poor skills of the technical staff of the government agency will have a negative association with the project's ***quality*** and ***operation*** as well. The data showed that the government ownership did not influence

the ***quality*** variable in a project, or that its influence was insignificant. The government as owner will influence ***quality*** through giving untimely variation orders, helping the consultant be uncooperative to the contractor or prepare poor contract documents including the specifications and design drawings. It will also influence the ***quality*** through specifying unrealistic construction durations, or award contracts for illogically low prices. The poor skills of its technical staff will add to this problem. Although the government ownership did influence other variables, yet it did not significantly influence the ***quality*** variable which will be influenced by the contractor and the consultant as well. It was seen from the data that the government ownership did not influence the ***function*** of a project variable, or that its influence was insignificant. The government will influence the ***function*** of a project through preparing defective design drawings or specifications. It will also influence the ***function*** of a project by contracting the design to a foreign designer who was not aware of the cultural background in the country thus preparing a design that will be negatively associated with the ***function*** of a project. It seems the influence of the government ownership on the ***function*** variable is not significant and that probably other parties could influence this variable. The data showed that the government ownership did not influence the ***life expectancy*** variable of a project, or that this influence was insignificant. This variable will be influenced by the government if it prepared defective design drawings or specifications, specified unrealistic construction durations or awarded an under priced contract to the lowest bidder. The same will happen through the poor technical skills of the government agency's staff or if the government contract the design to a foreign design firm that was not aware of the technical and local conditions of weather, soil and moving sand dunes. Other parties will influence this variable too, that is why the government ownership

influence was insignificant. It was seen from the data that the ***reputation*** of the parties' variable was influenced by the government ownership. Too many changes in legislation that will affect the construction industry are one way of influencing this variable. If the government was known to give limited access to her construction sites, or was known to have several disputes on its site ownership, this will no doubt affect its ***reputation***. Delayed payments will be the biggest influence on the ***reputation*** of the government, as well as getting in disputes over owner-caused delay, owner-directed acceleration, reasonable ***time*** extension or reasonable market value of variation orders. The same will happen through late variation orders or too many of them. By backing harsh consultants, the government will influence the ***reputation*** variable and could do the same through poor documentation or poor technical skills of its staff. If the government were to prepare the contact documents and it did this job poorly, it will be risking its ***reputation***. It will risk the same by selecting its contractors on the lowest bidder method, or accepting to award unrealistically low priced contracts. The delay in approval of drawings, schedules, materials, work done, quantities or tests will as well affect the ***reputation*** variable, and the same will happen if it delayed submitting the necessary drawings or information needed for the smooth running of the project. The data showed that the government ownership influenced the ***future relations*** of the parties to a project. Delayed payments are one of the major influences on ***future relations***. The settlement of claims in court will affect the relations of the parties, as well as backing harsh consultants. The problems arising from poorly prepared contract documents will have a negative association with the parties' ***future relations***. The same will happen through the government's delay in approvals of drawings, schedules, materials, work done, quantities or

tests. The government's delay in its submittal of necessary information or drawings will as well influence the parties' ***future relations***.

### 7.5.2) Private Ownership

It was seen from the data that the private ownership did influence the ***time*** variable of a project. Limited access to the site or parts of it will make the private owners influence the ***time*** variable, as might the dispute on site ownership, which will cause delay to the project. If the owner were to coordinate between several contractors and he did that poorly he will this way be influencing the ***time*** factor. Delayed payments by private owners will influence ***time*** claims, as will the late handover of the site to the contractor. Owner-directed acceleration will influence the ***time*** factor and the giving of the untimely variation orders or too many of them will as well have the same effect. If the consultant in a private project was harsh, uncooperative or weak, he will this way influence the ***time*** variable. If the contract documents were to be produced by the owner, and he did that poorly, this will undoubtedly negatively influence the ***time*** factor, whether these were design drawings, specifications, bills of quantities or the contract form. The private owner who specifies unrealistically short construction durations will this way be influencing the issuance of ***time***-based claims. The same is applicable to a private owner who nominates the wrong subcontractor to work with his contractor. This nominated subcontractor will delay the work and this will directly influence the ***time***-based claims initiated by the contractor against the owner. The poor technical skills of the owner's staff will be another item influencing the ***time*** factors if they were incompetent in managing the job successfully. Delays in approvals by the owner of submittals by the contractor, such as drawings, schedules, materials, work done, quantities or tests, will surely influence the ***time*** claims, as will the delay

by the owner to respond to any necessary information or drawings needed for the smooth running of the project. The ***time*** variable will also be influenced through designs presented by the owner and were designed abroad with a design firm that was not aware of the local conditions and capabilities of the local contractors, suppliers or manufactures. Here, a contractor will need extra time to find the suitable supplier or manufacturer. The data showed that the private ownership did influence the ***money*** variable of a project. Limited access of the contractor to the site or part of it is one way of influence. This way the contractor will need more time to finish the job or will need to accelerate to finish on time, and both ways he will incur additional expenses to do that. Another area of influence is through the unpredictable subsurface conditions. Private owners sometimes do their necessary soil investigations and hand them to the contractors before bidding for the project, but some poorly managed private projects and most of the small ones do not have any soil investigations before the bidding phase, thus leaving it for the speculation of the contractor. This way private owners will be influencing the ***money*** factor. Poor coordination between contractors in the private sector was shown from the data that it will be associated with the ***money*** variable. Delayed payment by owners as well was seen as a cause of ***money***-based claims. The delay in handover of the site or part of it to the contractor was seen as having a slight effect on the ***money*** factor in a project. The stoppage of work by owner, other than that provided for in the contract, was seen from the data as being associated with the ***money*** factor. It was also seen that disputes with the owner over reimbursement of owner caused delay, on reimbursement due to owner-directed acceleration, on reasonable ***time*** extension and on reasonable market value of variation orders all will be associated with the ***money*** factor in a project. The late order of variation was seen as highly influential on the ***money*** factor,

together with the late payment of the variation orders or too many of them being issued. The cause of consultant being uncooperative was seen as having moderate influence on the ***money*** factor as was seen with poor documentation in the project, which will be due to either the poor management of the contractor, owner, or consultant. The contract that does not specify the dispute resolution method was seen as having moderate influence on the ***money*** factor of a project as did the causes of nominated subcontractor and the insufficient project specified time. There was a high influence on the ***money*** variable by the poorly prepared contract documents that were contradictory, incomplete or ambiguous. Construction defects by contractor had a high influence on the ***money*** variable as seen from the data, and that poor materials used by the contractor and poor workmanship or ***quality*** of work by him had the same effect. The poor skills of the technical staff of the contractor were seen to have a large influence on the ***money*** variable, those of the owner and consultant had a moderate influence on the ***money*** factor. It was also seen from the data that there was a large influence on the ***money*** variable by the poor management by the contractor. The project being under priced and the dispute on the percentage of cost of added or deleted items had a moderate influence on the ***money***-based claims. The delay in approval of drawings, materials and quantities showed a high association with the ***money***-based claims, while the delay in approval of schedules, work done or tests showed a moderate influence. The discrepancies with specifications showed a moderate association with the ***money*** claims, whether the specifications were incomplete, contradictory or ambiguous. The delay in submittal of drawings by either owner, consultant or contractor had a moderate affect on the ***money*** variable while the poor submittal of shop drawings by contractor rated higher than his submittals of as-built drawings or schedules. Design drawings that are incomplete

had a high influence on the ***money*** factor, as did the large differences between the original and actual quantities of a project, which are usually the job of the consultant or sometimes the owner, and rarely will they be prepared by the contractor, such as in design –build arrangements. The data showed that the private ownership did influence the ***operation*** variable of a project. Earthquakes had a moderate association with ***operation***, whereas subsurface conditions had the same effect. Delayed payment by the owner had a high association with the ***operation*** variable, which could be due to delays in the work that will lead to ***operation*** problems later. Stoppage of work by the owner had a moderate association with the ***operation*** of a project, as did the dispute over reimbursement of owner-caused delay and the dispute over reasonable ***time*** extension. Variation orders as a whole had a high association with the ***operation*** of a project, whether given late or not paid on time or too many of them were given. Poor documentation was seen as having a moderate influence on the ***operation*** variable, while incomplete contract documents had a high influence; ambiguous or contradictory contract documents were both of moderate influence. Construction defects by contractor rated high on influence while poor workmanship and poor materials used by the contractor both rated as of moderate influence on ***operation***. The poor technical skills of the contractor's staff had a high association with the ***operation*** factor, whereas the poor skills of the technical staff of the owner and consultant rated moderate. A high influence was noted by the poor management of the contractor while moderate influence was noticed by the dispute on the percentage of cost of items either added or deleted. The delay in approvals rated of moderate influence when there were a delay in approving drawings, materials, work performed or measured quantities, and of low influence when the delay was for schedules, performance or tests. Incomplete specifications rated a

moderate influence on the performance factor, the same, as did the delay in submittal of drawings by the owner and by the consultant. Poor submittals by the contractor of as built drawings also were of a moderate influence. Design drawings that are incomplete or defective or are not compatible with the capabilities of local contractors were seen as of moderate influence on the ***operation*** factor, the same did the large differences between the original and actual quantities, especially that the private sector usually used the lump sum form in which large differences of quantities could harm the contractor. It was seen from the data that the private ownership did not have an association with the ***quality*** variable in a project, or that its association was insignificant. Earthquakes had a moderate association with ***quality***, as did the subsurface conditions in a project, the poor coordination between contractors and the delayed payment by owner. The dispute over reasonable ***time*** extension and the late order of variations had a moderate influence as well. Too many variation orders had a moderate association too while incomplete contract documents had a high association with the ***quality*** factor. The construction defects by the contractor had a high association with the ***quality***-based claims, and the poor workmanship and materials used in the work had a moderate association with the ***quality*** factor. The poor technical skills of the contractor's staff rated high while those of the owner and consultant rated moderate. Again, the poor management by the contractor had a high influence on the ***quality*** issue in private projects, while the dispute on the percentage of cost of items (either added or deleted) rated as of moderate influence on the ***quality*** variable. The delay in approval of drawings only rated of a moderate influence on ***quality***, and the incomplete specifications had the same effect. The poor submittal by the contractor of shop drawings had a high influence on ***quality***, as did the great differences between original and actual quantities. The

incomplete design drawings had a moderate association with ***quality*** in a project. The total influence of the private ownership was seen as insignificant. The data showed that the private ownership did not influence the ***function*** of a project variable or that its influence was insignificant. The late timing of variation orders had a moderate weight of association with the ***function*** variable, as did the incomplete contract documents. The latter whether prepared by the owner, consultant or contractor will have its association with the ***function*** variable. The construction defects by the contractor had a high association with the ***function*** factor, as well as the poor skills of the technical staff of the contractor did. The poor management by the contractor rated of moderate association as well as the poor submittal by contractor of shop drawings. The total influence of the private ownership was seen as insignificant on this variable. It was seen from the data that the private ownership did not influence the ***life expectancy*** variable of a project, or that its influence was insignificant. Earthquakes had a moderate association with the ***life expectancy*** variable. The delayed payment by owner and the dispute on reasonable ***time*** extension both had a moderate association with the ***life expectancy*** factor. The incomplete contract documents had a moderate association with this variable too. The construction defects by the contractor had a high association with the ***life expectancy*** of a project, as did the poor skills of the contractor's technical staff. Poor workmanship rated as of a moderate association with the ***life expectancy*** variable, as did poor management by the contractor. The tardy submittal by contractor of shop drawings and the existence of large differences between the original and actual quantities, both rated as of moderate influence over the ***life expectancy*** variable in a project. The total influence of the private ownership on this variable was seen as insignificant. The data showed that the private ownership did not influence the ***reputation*** of the parties

variable of a project, and that its influence was barely insignificant. Subsurface conditions had a moderate association with the ***reputation*** factor, as did the shortage of basic resources. The delay in payment by owner had a high association with the parties' ***reputation*** while the stoppage of work by the owner and the dispute over reimbursement of owner caused delay, both had a moderate association with this factor. The dispute over reasonable ***time*** extension and the late timing of variation orders, both were seen to have moderate influence, as did that variation orders were not paid on time and that there were too many of them. Poor documentation (by any party) rated of moderate weight of association, while incomplete contract documents rated a high influence on the ***life expectancy*** factor. The construction defects by the contractor, the poor management by the contractor and the poor technical skills of the contractors' staff, all rated of high influence on this variable. Poor workmanship, poor materials used by the contractor and poor skills of the technical staff of the owner, all rated as of moderate association with the ***reputation*** of the parties factor. The same case was with the dispute over the percentage of cost of items added or deleted from the project. The delay in approval of drawings, materials and measured quantities, all rated as of moderate influence on the ***reputation*** variable. The delay in submittal of drawings by owner and by consultant and the poor submittal by contractor of shop drawings all had a moderate association with this variable. Errors in design drawings and great differences between the original and actual quantities of work in a project, both rated of moderate influence on the ***reputation*** of the parties variable. The total influence of the private ownership on this variable was seen as insignificant. It was seen from the data that the private ownership did not influence the ***future relations*** variable of a project, and that its influence was barely insignificant. Unpredictable subsurface conditions had a moderate

association with this variable, as did the shortage of basic resources. This variable was moderately associated with the poor coordination between contractors and by the stoppage of work by owner. It was rather highly associated with the delay in payment by owner. The dispute over reimbursement of owner caused delay and the dispute over reasonable ***time*** extension both had a moderate association with the ***future relations*** variable. The late ordering of variations, as well as not paying them on time have both rated as having a moderate association with this factor. Too many variations also had a moderate weight of association. Poor documentation in a project by any party also rated a moderate weight of association, and the poorly prepared contract documents, whether incomplete or contradictory, both showed moderate weight of association as well. The contract that does not specify the dispute resolution method also showed moderate influence on this variable. Construction defects by the contractor and the poor management by the contractor both rated of high influence. The same high influence was shown by the poor technical skills of the contractor. Moderate weight of association was shown by poor workmanship of the contractor and poor technical skills of the owner's staff. The project being under priced and the dispute over the percentage or cost of items added or deleted from the contract both rated as moderate influence, while the delay in approval of drawings had a high weight of association with the ***future relations*** of the parties. The delay in approval of materials, measured quantities and tests, all showed a moderate association with this factor. Any delayed submittals of shop drawings and as-built drawings both showed a moderate weight of association, as did the design drawings that were incompatible to the capabilities of the local contractors. The contradictory design drawings and the large differences between the original and actual quantities, both showed moderate influence over the ***life expectancy*** variable of a project.

The total influence of the private ownership on this variable was seen as insignificant.

## 7.6) Hypothesis No. 6

**H6 : The size of a project has no influence on the eight variables.**

This hypothesis was rejected by the results of the analysis made using the chi-square test and the proportion test and by the weighted associations. There were fourteen sub hypotheses rejected by the results of the analysis out of twenty four sub hypotheses, which gives a result of 58.3% rejection, and that is enough to reject the sixth general hypothesis that the size of a project has no influence on the eight variables.

### 7.6.1) Small Projects

It was seen from the data that the small projects (under 5 million Riyals) did influence the ***time*** variable of a project. ***Time*** was largely influenced by the delayed payment by the owner, which was seen as the highest-ranking claim cause out of all the claim causes and groups. The ***time*** variable was influenced by the incomplete contract documents. Some small private owners give little attention to preparing the contract documents, either preparing it by themselves, if they had the necessary staff, or hiring a consultant. Rarely will a small owner be prepared to pay 2-3% of his project costs for preparing the design and contract documents. Some studies in Saudi Arabia have shown that the average percentage of the project cost paid to consultants was less than 0.5%, which is one eighth of what is mandatory in some neighbouring Gulf countries. The ***time*** variable in a project was seen from the data as being greatly influenced by the construction defects by the contractor. The selection of contractors in small government projects under five million Riyals does not necessitate prequalification and thus any contractor can bid for small public projects. It seems that the private sector too does not

pay enough attention to its selection techniques. These construction defects by contractors might also be due to the poor supervision by consultants or that there in no consultant at all, which is the case with some small private projects. The poor skills of the technical staff of the contractor were seen as the highest claim cause associated with the ***time*** factor in small projects. This will no doubt cause rejection of work by the owner or consultant and the need for rework, which will cause an association with ***time***. The discussion above on selection of contractors is applicable here too. Poor management by contractor was seen as associated with the ***time*** factor. If the contractor cannot handle the management of his project, this will influence the ***time*** factor in the project. The data also showed that the dispute over the percentage or cost of items added or deleted did have an association with the ***time*** factor in small projects. This is largely due to the poorly prepared contract documents, especially the contract form in the private sector, and because there is no provision for added items in public contract forms. The data showed that the delay in approval of drawings did influence the ***time*** variable in small projects. This delay could be in public or private projects and will be by the owner or consultant. In anyway the delay has its strong association with the ***time*** variable. Incomplete specifications have their negative effect on the ***time*** variable in small projects. This discrepancy could be due to the low paid consultant in the private sector and the consultant selected by the least bidder method in public projects, it will also be due to the rush in doing the work due to that the owner did not give enough time to the consultant to prepare a complete job. The same is shown in relation to incomplete design drawings and that they will strongly be associated with the ***time*** variable in a small project. The argument above on low paid consultants and the wrong selection techniques is applicable here too. It was seen from the data that the small

projects did not influence the ***money*** variable in a project. The ***money*** factor was associated with delayed payments by owner, which could cause financial problems to the contractor. The incomplete contract documents also were associated with the ***money*** variable. Many small contractors lose ***money*** because of these incomplete contract documents, whether they be drawings, bills of quantities, specifications or anything else, specially in lump sum contracts which are widely used in the private sector. The ***money*** factor was also associated with construction defects by the contractor. These defects will cause losses to the contractor or even other contractors on site, or to the owner himself. Poor skills of the technical staff of the contractor and poor management by him are two other claim causes influencing the ***money*** factor in small projects. Both causes will cause losses to the contractor in ***money*** and ***time***. The dispute over the percentage or cost of items added or deleted from the contract was also seem from the data as influencing the ***money*** factor. Incomplete specifications were another claim cause that influenced the ***money*** variable in small projects. This claim cause gives the owners in small private projects the opportunity to dictate their own specifications on the contractor. It also gives some contractors the opportunity to negotiate the missing specifications, and weak owners usually lose in this battle. This ***money*** variable was seen as not influenced by small projects, or that this influence was insignificant. It was seen from the data that the small projects did not influence the ***operation*** of a project variable. This variable was seen to be influenced by the incomplete contract documents, which are a problem in small projects, especially private ones. ***Operation*** as a factor was also associated with construction defects by contractor. The poor technical skills of the contractor's staff and the poor management by the contractor are two other causes of claims that are also associated with the ***operation*** of a project factor. The last three causes are

all related to the poor performance of the contractor, which shows a degree of association with the ***operation*** factor. The total influence of the small sized projects on the ***operation*** variable was insignificant and it was only strongly associated with four out of seventy five claim causes. The data showed that the small project size did not influence the ***quality*** variable of the project or that the influence was insignificant. The incomplete contract documents had a strong association with this variable. There was also a strong association with the construction defects by the contractor, which no doubt have their negative effect on the ***quality*** of work. The ***quality*** variable was also influenced by the poor skills of the technical staff of the contractor and by his poor management as well. The incomplete specifications also had their association with the ***quality*** factor, whether these incomplete specifications were the fault of the consultant, owner, or to a much less degree due to the contractor who did not point this out before bidding, or that he himself prepared the specifications in design-build arrangements, which are rare in small projects in Saudi Arabia. The previous influences were not enough to reject the sub-hypothesis that the small projects did not influence the ***quality*** variable. The data showed that the small project size did not influence the ***function*** of a project variable, or that its influence was insignificant. This factor was only strongly influenced by two claim causes. The first was the construction defects by the contractor, which has been seen to influence all eight variables in small projects. The second strong influence was by poor skills of the contractor's staff. These two influencing causes of claims were not enough to make us reject the sub hypothesis that the small size projects did not influence the ***function*** of a project variable. It was seen from the data that the small size project did not influence the ***life expectancy*** variables, or that its influence was insignificant. The incomplete contract documents had a strong influence

on this variable. Incomplete or missing specifications or drawings can have a negative effect on the ***life expectancy*** factor. The same strong effect was seen from the data by the construction defects of the contractor and by the poor skills of the technical staff of the contractor. It is shown that contractors have their influence on the ***life expectancy*** of a project. These three strong influences by the claim causes were not enough to reject the sub hypothesis that the small projects do not influence the ***life expectancy*** factor of a project. The data showed that small size projects did not influence the ***reputation*** of the parties' variable or that its influence was insignificant. The incomplete contract documents had a strong influence on this variable. Whether it is an owner or consultant, their ***reputation*** will be in risk by producing these incomplete contract documents, which were seen to **impact** various variables in a project including the ***time*** and ***money*** variables. Construction defects by the contractor had a strong influence on this variable as well. No doubt the influence of this claim causes will be negatively shown on the contractor who makes these defects, and to a lesser degree on the consultant who supervises this job as well. The poor skills of the technical staff of the contractor also had a strong influence on the ***reputation*** variable. This claim cause will undoubtedly be associated with the ***reputation*** of the contractor. The previous influences were not enough to reject the sub hypothesis that the small project did not influence the ***reputation*** of the parties' variable. It was shown from the data that the small size project did not influence the ***future relations*** of the parties' variable in a project, or that its influence was insignificant. There were only two claim causes that had a strong influence on this variable. The first was the claim cause of construction defects by the contractor, which will have its negative effect on the ***future relations*** of the parties. The greater the defects, no doubt the greater the negative association will be with the ***future relations***

between the parties to a project. The second claim cause that had a strong association with this variable was the poor skills of the technical staff of the contractor. This will probably be associated with the ***time*** and ***quality*** variable as well, which will shed a negative association on the ***future relations*** of the parties. These influences were not enough to reject the sub hypotheses that the small projects did not influence the ***future relations*** variable of a project. From the above discussion of eight sub hypothesis, it is shown that the small size projects did not influence seven out of eight variables to a project, and that the only strongly influenced variable was that of ***time***.

### 7.6.2) Medium Sized Projects

It was seen from the data that medium size projects (5-20 million Riyals) did influence the ***time*** variable of a project. ***Time*** was strongly influenced by the subsurface conditions claim, while small projects were not influenced by this cause of claim. It is because the larger the project the deeper the foundations will be and the more claims will arise built on this cause. The ***time*** variable was also influenced by the stoppage of work by the owner. There are some clauses in most contracts, of which the Public Works Contract used in government project is one, that give the right to the owner or consultant to stop the work on site. Abusing this clause or stopping for reasons other than stated in the contract will influence the ***time*** variable and can cause delay to the project. The dispute over reimbursement due to owner caused delay and the dispute over reasonable ***time*** extension; both were seen as influencing the ***time*** variable. Both the private and public owners are tough negotiators and will rarely reimburse the contractor due to delays caused by the owner, or even give the contractor the fair ***time*** extension. The timing of variation orders, being given late, was seen from the data as strongly association

with the ***time*** variable. No doubt that this is largely due to poor management by the owner or consultant and it will have its negative influence on the ***time*** variable in the project. The claim on variation orders not being paid on time was also seen as strongly influencing the ***time*** factor and too many variations also associated with the ***time*** variable strongly. The management of variation orders was seen in general to cause influence on the different project variables, especially ***time*** and ***money***. The claim cause of the consultant being uncooperative to the contractor was also seen from the data as being strongly associated with the ***time*** variable. This is a cultural problem and has been found in both the private and public sectors as well. The incomplete contract documents were also found to be strongly associated with the ***time*** variable. This will be caused by either the owner or consultant and to a lesser degree by the contractor in design-build procurement methods. The ***time*** variable was also associated with the construction defects by the contractor, which will cause rework or stoppage of the work. Poor skills of the technical staff of the contractor were also seen as associated with the ***time*** variable, together with the poor management of the contractor. The three previous causes are all related to the contractor, who was regarded as an influencing factor on time through his actions or omissions. The data also showed that the dispute over the percentage or cost of items added or deleted from the contract had an influence on the ***time*** variable. This item is rarely well addressed in either public or private contracts and was seen to have a negative influence on many variables in a project. The claim cause of that the contract does not specify the dispute resolution method was also seen as associated with the ***time*** variable. The parties to a project in the private sector do not usually take enough care to include this clause, hoping that every thing would go smoothly, while public contracts all have clauses covering this issue. The delay in approval of drawings

was seen to have a strong association with the ***time*** variable. This delay will be by the owner or the consultant, and in both cases will negatively influence the ***time*** factor in a project, especially in government projects where the large work load could delay the approvals for months. The same strong association was found to come from delay in approval of material and finished work. The delay in submittal of drawings by owner was also found to be associated with the ***time*** factor in a project. In addition, errors in the design drawings and incomplete sets of design drawings were both seen as having a negative influence on the ***time*** variable. These discrepancies in the design drawings are due to the owner or consultant in public projects and due to either of them or to the contractor in private design-build projects. The least claim cause found from the data as influencing the ***time*** variable was that on large differences between original and actual quantities, which will be due to the low paid consultant, or choosing the wrong one for the project. It will also be due to the owner's own staff poor performance. This problem will be associated with private projects on lump sum basis more than it will with unit rate contracts either in the private or public sectors. Lump sum contracts are rarely used in public projects, and the unit rate contract will make it easier for contractors to be paid for whatever work they do. It was seen from the data that the medium size projects did influence the ***money*** factor in a project. A strong association was noticed by the delayed payment by owner, which was seen to influence several other variables. This ***money*** variable was also associated with the claim on dispute over reimbursement of owner caused delays. Owners are seldom ready to admit of their cause to delay the project, so they keep fighting on this issue, thus influencing the ***money*** factor in the project. The same applies to the dispute on reasonable ***time*** extension. The late timing of variation orders was seen as also influencing the ***money*** factor. This will

necessitate rework or delaying the project, thus affecting the overheads of the contractor. The late payment of variation orders was also found to strongly influence the ***money*** factors, as did the issuance of too many variation orders. It seems that variations are not dealt with in a professional way in the Saudi construction industry, which caused a lot of negative influence on several project variables. Construction defects by the contractor had a strong association with the ***money*** variable, as well as the claim on the project being under priced. The tendency of owners in both the public and private sectors to take the prices down sometimes to illogical levels will no doubt influence the ***money*** variable in a project. This variable was also seen to be associated with the dispute over the percentage or cost of items added or deleted from a contract. This claim cause can be dealt with using more professional knowledge of contracts and including some clauses in public and private contracts to minimize the disputes on such matters. The delay in submittal of drawings by the owner was found to have a strong association with the ***money*** variable. The errors in the design drawings was also seen as having a strong association with this variables as did the incomplete sets of design drawings. It is evident that a lot of owners and consultants need to professionally address this issue of design drawings, which has shown to have discrepancies leading to negative influences on the different variables in a project. The delay in approval of drawings were seen as well to have a strong influence on the ***money*** factor. This delay will no doubt delay the other activities in the project with the possibility of influencing the cost of overheads of the contractor. The last claim causes seen as having a strong influence on the ***money*** variable in medium size projects was that on large differences between the original and actual quantities in a project, which could be due to either the owner or the consultant doing a poor job. The data showed that the medium size

projects did influence the ***operation*** variable of a project. The delayed payments by owner were seen as strongly affecting the ***operation*** in a project. This will be due to the delay in handing over the project as a consequence of delaying the payments, thus delaying the ***operation*** of the project. The ***quality*** factor was not associated with this claim cause, so the association with the ***operation*** factor might be due to the delay in ***time*** and not through an association with ***quality***. The dispute over reimbursement due to owner-caused delay was also seen as strongly associated with the ***operation*** value. It seems that the ***operation*** factor is usually **impact**ed when there is an association with the ***money*** variable as well. The late ordering of variations was also found to strongly be associated with the ***operation*** of a project. This cause of claim was also seen to influence the ***time*** and ***money*** variables as well. This indicates that there is a need to professionally deal with the issue in the construction industry. The latter claim is linked to the two other claims on late payment of variations and ordering too many of them. The claim on the consultant being uncooperative to the contractor had a strong influence on the ***operation*** variable as well. It was found that the construction defects by the contractor had a strong association with this variable, together with the claim cause of poor technical skills of the contractor's staff. The last two causes show the effect of choosing lowest bidders and highlight the need to upgrade the selection techniques. The delay in approval of drawings was seen as having a strong influence on ***operation***. Probably because this will delay the handing over of the project, thus delaying the ***operation*** of the facility. The last claim cause seen as influencing the ***operation*** in a project was on that the original design was incompatible with the local conditions, so suggesting that there will be some problems with ***operation*** due to that the local conditions were not taken into consideration during the design phase. It was seen from the data that the

medium size projects did not influence the ***quality*** variable in a project or that this influence was insignificant. This variable was only strongly associated with two claim causes. The first was the construction defects by the contractor and the second was the poor skills of the technical staff of the contractor. It seems the only strong influence on the ***quality*** variable in medium size projects was by the poor ***quality*** of contractors, which gives the indication that a lot of effort should be put to improving the ***quality*** of contractors working in this range of size of projects. The data showed that the medium size projects did not influence the ***function*** of a project variable or that this influence was weak and insignificant. The data showed no strong influence by any of the claim causes. Although there were two strong influences by claim causes in small size projects, yet this could mean that the influence decreases by size increase or that probably the interviewed professionals were not quite familiar with the meaning of the word "***function***". It was seen from the data that medium size projects did not influence the ***life expectancy*** variable of a project, or that its influence was insignificant. Although that there were strong influences in small size projects from three claim causes, yet there were no influences by any claim on the medium size projects, which justifies the acceptance of the sub hypothesis that medium size projects did not influence the ***life expectancy*** variable of a project. The data showed that medium size projects did not influence the ***reputation*** of the parties' variable of a project, or that this influence was weak and insignificant. This variable was influenced by the delayed payments by owner as well as by the dispute on reimbursement of owner caused delay. Both previous causes put the owner's ***reputation*** at risk, either by late payments or by not settling the dispute over his self- caused delay. This variable was also associated with the claim on construction defects by the contractor and the poor skills of his technical team. In addition, poor management by the

contractor had a strong influence on the ***reputation*** variable. The three previous claim causes are all related to the poor standards of contractors working in this range of medium size projects. These influences were not enough to reject the sub hypothesis that the medium size projects do not influence the ***reputation*** variable of a project. It was seen from the data that the medium size project did not influence the ***future relations*** variable. The late payment by owner and dispute over reimbursement due to owner caused delay; both strongly influence the ***future relations*** of the parties. The claim cause on variation orders not paid on time had the same effect. The three previous claim causes all relate to the owners actions or omissions. The poor skills of the contractor's technical staff and the poor management by the contractor both had strong effects on the ***future relations*** variable. These last two causes were related to the poor performance of the contractor. The last claim cause influencing this variable was the dispute over the percentage or cost of items added or deleted from the contract. This is related to all parties of the project. The previous influences were not enough to reject the sub-hypothesis that the medium size projects did not influence the ***future relations*** of the parties' variable in a project.

### 7.6.3) Large Projects

It was seen from the data that the large size projects (over 20 million Riyals) did influence the ***time*** variable of a project.

#### Associated with the *Time* Variable

***Time*** was strongly influenced by subsurface conditions. Large projects will mostly have deep foundations and that is why this claim cause on unexpected subsurface conditions has a strong influence on the ***time*** variable. Design drawings will need to be reproduced and the kind of

foundation could change to another system, all of which will consume valuable project time. The shortage of basic resources or services strongly influenced the ***time*** variable. Large projects need more resources and services to be built than medium or small ones, that is why large projects were largely associated with this claim cause. Poor coordination between contractors was seen from the data as also being associated with large projects. The larger the project, the more subcontractors it will need and that is why the association with poor coordination between the contractors was strongly felt in large projects. The claim cause on delayed payments by owner was strongly felt in the large size projects sector. This was felt in all project sizes as well (small and medium), but the association with large projects is the strongest. Large projects need lots of financing and the association with delayed payments on them is found to be the strongest. The dispute on reasonable ***time*** extension was also found to have a strong association with the ***time*** variable in large projects. The larger the project, the longer the contract duration might be, and the more probable will there be disputes over extension of ***time***. The late order of variations was also seen to have a strong influence on the ***time*** variable. Large projects will most probably be more professionally managed by the contractor than the smaller ones, and the association these late variations will have with the ***time*** schedule and on the disruption of work will be more strongly felt in large projects. The same effect was noticed by the claim on too many variation orders. The same disruption to the progress of work and the ***time*** schedule will be felt in large projects due to the issuance of too many variations. The claim cause on that the consultant is not cooperating with the contractor was seen to have a strong association with the ***time*** factor. The larger the project, the more likely it will be more complicated, and the more cooperation it will need between all parties for the smooth completion of the project. The ***time*** variable in large projects

was also seen as associated with the construction defects by the contractor, which will need rework or stoppage of the work in part or in full, thus influencing the ***time*** factor. The poor skills of the technical staff of the consultant were seen as influencing the ***time*** variable in large projects as well. The management of information in large projects necessitates a high calibre consultant or else things might go wrong causing delays in the project. The poor management by the contractor was seen as having a strong influence on the ***time*** variable. As the major player in a project, the contractor's poor management will have a negative effect on the progress of work. It was also seen from the data that the dispute on the percentage or cost of added or deleted work, had a strong influence on the ***time*** factor. This is a problem in both public and private projects, and the lack of a dependable contract form in the private sector will not help to minimize the occurrence of this problem. The Public Works Contract should also be amended to accommodate for such problems. The claim on that the project was under priced was also seen to have a strong association with the ***time*** variable. This will cause some financial problems to the contractor, who will have to stop sometimes to solve these problems, thus influencing the ***time*** factor. The delay in approval of drawings, materials, work done or schedules were found to have association with the ***time*** variable in large projects. There will be many approvals needed to keep the large project running, and any delay in approvals in one or more of the above will have a strong association with the ***time*** factor. These delays will be due to consultants or owners. The same effect was seen by the delay in approval of tests in a project. The delays in submittal of drawings by the consultant and by the contractor were both strongly affecting the ***time*** variable in large projects. This delay will no doubt impact the progress of the work and will delay the project as a whole. The poor submittal of shop drawings by the

contractor was also found to strongly have association with the ***time*** factor. This poor submittal will force the consultant to order resubmission of the drawings and that will delay the works. The ***time*** variable was also influenced by the poor submittal by contractor of schedules. Poorly prepared schedules will be rejected by the consultant or owner, and if implemented by the contractor, will cause disruption of the work or at least the less than ideal benefiting from the available resources. This will lead to delays and an influence on the ***time*** variable. The claim cause of the original design drawings being not compatible with the capabilities of local contractors was found to have an association with the ***time*** factor in large projects. This will force local contractors to seek the help of other larger contractors or even international ones to perform all or part of the job, which will take some ***time*** and have its impact on the project duration. The ***time*** variable was also found to be influenced by incomplete design drawings. This will require the issuance of the missing sets of drawings, which will delay some of the activities in the project. This will be due to the owner or to the consultant, and whoever is the cause, the project will suffer.

**Association with the *Money* Variable**

The data showed that the large size projects did strongly influence the ***money*** variable of a project. This variable was associated with the unpredictable subsurface conditions. When a contractor encounters difficulties with the soil or the kind of foundation required for the project without considering those at the bidding stage, this will surely be associated with the ***money*** variable. An owner will encounter the same difficulties and will be asked to pay for the new method of excavation or foundation laying. The claim cause of delayed payment by owner was also found to strongly influence the ***money*** factor. This delay will put

pressure on the contractor's finances and will no doubt have its association with the ***money*** variable. Dispute about reasonable ***time*** extension, was also seen as strongly associated with the ***money*** variable. The issue of variation orders was found to strongly have association with the ***money*** variable through the late ordering of variations, the late payment of these variations and the issuance of too many of them. This issuance should be professionally dealt with and it is the duty of professional engineering societies to make its members aware of the complications associated with this matter and the best ways to handle the negative effects arising from it. The claim cause of the consultant being un cooperative to the contractor was also found to have a strong influence on the ***money*** factor. This lack of cooperation was earlier seen to have association with the ***time*** variable, and will consequently have association with the ***money*** variable due to the loss of valuable ***time***. The construction defects by the contractor and the poor management by him were both found to have a strong influence on the ***money*** variable. The defects will require repair or rework which will cost ***money***, and the poor management does not make full use of the available resources and will lead to time overruns that cost the contractor a lot. The ***money*** variable was also strongly influenced by the dispute on the percentage or cost of items added to or deleted from the contract. This dispute was seen to have an association with the ***time*** factor earlier and this will consequently have an association with the ***money*** factor. The claim cause of that the project was under priced was found to strongly influence the ***money*** variable. The contractor will suffer from this situation due to that he is not covering his expenses, while the owner will also suffer by getting into a dispute with the contractor and by the possibility of getting poor ***quality*** work. The delay in approval of drawings, schedules, materials, work done or measured quantities was found to have a strong influence on the ***money***

variable. Any delay will cause the loss of ***money***. The loser will be either the contractor or the owner, who will receive his project late and lose valuable ***operation*** time. The delay in submittal of drawings by the contractor was seen as strongly influencing the ***money*** variable in large projects. This delay can be connected to the poor management by the contractor mentioned earlier and will have its negative influence on the progress of the work, thus causing delay, which will surely be translated into ***money***. The great differences between the original and actual quantities of work in a contract were found to have a strong association with the ***money*** variable. Contractors do not want to be faced with the situation that they have to do more work than what they have bid for. Doing more work will no doubt cost them ***money*** in lump sum contracts, where the bills of quantities are regarded as guidelines only. The last claim cause found to influence the ***money*** variable in large projects was that of incomplete design drawings. The delay caused to complete these drawings will cost ***money***, and the lost information in the drawings can make the consultant ask for more than the contractor has calculated for.

**Association with the *Operation* Variable**

The data showed that the large projects did strongly influence the ***operation*** of a project variable. This variable was influenced by the delayed payment by the owner. This will be the cause of late handover of the project and thus delaying the ***operation*** of that project. The dispute over reasonable ***time*** extension was also found to have an association with the ***operation*** variable. The same discussion mentioned above is applicable here too. The timing of variation orders, being given late in relation to the different activities in the project, was also influenced by the contractor's defective work. The latter will cause ***quality*** problems that will have an association with the ***operation*** of the project. The same

effect was found by the poor skills of the contractor's technical staff and by the poor management by contractor, both of which will have a negative influence on the ***operation*** of a project and its ***quality***. The dispute over the percentage or cost of items added or deleted from a contract was also found to have an association with the ***operation*** factor. This could be through the delay that will take place in a project due to this dispute and the delay in ***operation*** of this project. The delay in approval of drawings, schedules, materials and work done were all found to influence the ***operation*** variable, probably through the delay these will cause in the handover of the project and consequently the start of ***operation*** of the project. The poor submittal by contractor of schedules was seen to have an association with the ***operation*** of a project, probably through the overrun in time due to these poor schedules and the delay this will cause to the starting date of ***operation***. The last claim cause found to influence the ***operation*** factor was that of the design drawings being incompatible with the capabilities of the local contractors. This will influence the ***quality*** of the output and thus the ***operation*** of the project will be impacted too.

**Association with on the *Quality* variable**

The data showed that the large size projects did strongly influence the ***quality*** variable in a project. This variable was associated with the claim cause of the construction defects by the contractor. Obviously, this claim associated with the ***quality*** variable and is associated with other variables as well. It was seen that this claim cause ranked as one of the highest claim causes in this research. The poor management by the contractor was also seen to influence the ***quality*** variable of the project. The two claim causes strongly affecting ***quality*** were related to the contractor. There are other causes that can be associated with ***quality*** as

well, but the data showed that they had a weak effect on the ***quality*** variable, but collectively they made us reject the sub hypothesis that the large projects do not influence the ***quality*** of a project.

**Association with the *Function* Variable**

The data showed that the sub hypothesis that large projects did not influence the ***function*** variable in a project was accepted. There was no claim cause of a strong influence found in this study.

**Association with the *Life Expectancy* Variable**

It was seen from the data that the sub hypotheses that large projects did not influence the ***life expectancy*** variable of a project was accepted. The overall influence was weak and the null sub hypotheses was accepted. This variable was strongly associated with the dispute on reasonable ***time*** extension and by the construction defects by the contractor. Although there are other causes that could be associated with the ***life expectancy*** of a project, yet all these had weak influences.

**Association with the *Reputation* Variable**

The data showed that large projects did strongly influence the ***reputation*** of the parties' variable. This variable influenced by the late payments by owner which no- doubt affects any owner, public or private. The dispute over reasonable ***time*** extension was also seen from the data as strongly influencing the ***reputation*** variable in a project. Owners who are known to be tough negotiators or usually deny the contractor any rights to an extension of ***time*** will have their ***reputation*** negatively impacted. It was the same with any contractor who is known for over

claiming ***time*** or ***money***. The ***reputation*** variable was also seen to be associated with the claim on late ordering of variations. This will be associated with owner's or consultant's ***reputation***. Construction defects by contractor were also found to be associated with the ***reputation*** factor in a project. This of course will negatively impact the contractor's ***reputation*** and will as well impact the consultant's ***reputation*** for poor supervision. Poor management by the contractor was also seen as strongly influencing the ***reputation*** variable. The same effect was found due to the dispute over the percentage or cost of items added or deleted from the contract. If a public or private owner was known for his persistent denial of the contractor's rights for additional work, or was known for being hard on these issues, his ***reputation*** will certainly be negatively affected. The same will apply for contractors who over claim or take the opportunity of extra work to make most of their profits when they bid very low, with this aim in mind. The ***reputation*** variable was also found to be strongly associated with the delay in approval of drawings, materials and finished work. This will be association with the ***reputation*** of owners and consultants as well. The delay in submittal of drawings by the consultant was seen as to be association with the ***reputation*** variable in a project. This will be the consultant's ***reputation*** or even the owner's, if he were known for not monitoring his consultant's performance.

**Association with the *Future Relations* Variable**

The ***future relations*** of the parties' variable was seen to be strongly influenced by large projects. This influence was found to be through the delayed payments by the owner. This negative association will influence the future working relations between owners and contractors. The dispute over reasonable ***time*** extension was also seen as affecting this variable. The issue of variation orders was found to influence the ***future relations***

of the parties. The late ordering of variations and the late payment of these variations were two claim causes found to be associated with this variable. The issue of the consultant being uncooperating with the contractor was another claim cause to influence the ***future relations*** of the parties. This will be associated with the relations between the contractor and the consultant as well. The contractor might not bid for projects he knows will be supervised by a certain consultant, or will do so putting a mark up for this consultant's attitude. This variable was also influenced by the construction defects and poor management by contractor. An owner will not be happy working with a contractor who previously showed low levels of ***quality*** and management in a project, especially large ones. The dispute over the percentage or cost of items added to or deleted from the contract was also found to influence the ***future relations*** variable in large projects. The same effect was seen by the delay in approval of drawings, materials and finished work. No contractor will be happy with an owner or consultant who delays him in approvals and risk getting himself into delay penalties. The last claim cause found to strongly influence the ***future relations*** variable in a project was that of delayed submittals of drawings by the consultant. This will be associated with the relations of the contractor with the owner and consultant and that between the consultant and owner who will recognize that the consultant's delay had a negative impact on the project as a whole.

**Summary**

The research showed that the party to a project (owner, consultant or contractor) does not influence the type of claim in a project, although generally some sub hypotheses showed a certain influence on some claim groups. The data also showed that there is no difference between the type

of claims in different types of ownership (government or private). This ownership type did not influence the type of claim in a project. It was also noticed from the data that the size of a project (small, medium or large) had influence on the type of claim in a project. The null hypothesis was accepted for the first three hypotheses' while the next three were rejected, and this showed that the project party (owner, consultant or contractor) had an influence on the association with the eight variables (***time, money, operation, quality, function, life expectancy, reputation*** and ***future relations***). Another hypothesis was tested and showed that the type of ownership (government or private) has an association with the eight variables usually associated in a project. The last tested hypothesis showed that the size of a project (small, medium or large) had an influence on the eight variables that are usually influenced in a project.

# Chapter (8)

# Discussion and Conclusion

## 8.1) Introduction

This chapter will discuss the findings of research in this thesis and how strong influences were sorted out. The total weight of association with the eight variables regarding the party to a project, ownership and size of a project will also be highlighted. Strongest association with the different claim groups on the party to a project (owner, consultant, and contractor), on the ownership (government/private) and on the size of a project (small, medium, and large) will all be highlighted as well. The strong impacts on the total sample will be discussed at the end of the chapter. A paragraph on revisiting the research model and future research needs concludes this chapter.

## 8.2) Total weight of association with the variables

The total weight of association with each variable by each claim group was calculated in regards to the three factors; party to a project, ownership and size of a project. The results were plotted into tables and figures.

## 8.3) Summary of Findings

### 8.3.1) Party to a Project

1- From the data it was noticed that the 'information based group' of claims had a stronger weight of association with the eight variables than the 'contract administration group' of claims.

2- In the 'information based group' of claims, Table (8-1) consultants felt the greatest association followed by owners. Contractors felt

the least association with the claim group.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Owners** | 29.6 | 29.6 | 14.0 | 14.8 | 3.2 | 3.6 | 11.2 | 10.4 | **116.4** |
| **Contractors** | 16.5 | 22.9 | - | - | - | - | - | - | **39.4** |
| **Consultants** | 41.7 | 22.9 | 19.7 | 21.7 | 3.3 | 9.7 | 19.5 | 15.5 | **154** |
| **Total** | **87.8** | **75.4** | **33.7** | **36.5** | **6.5** | **13.3** | **30.7** | **25.9** | **309.8** |

**Table ( 8-1 )Total weight of association with the eight variables by the Information Based group of claims regarding Party to the project.**

3- ***Time*** followed by ***Money*** were the highest associated variables, with consultants feeling the highest association with ***Time*** followed by owners, who felt the highest association with ***Money*** followed by both contractors and consultants. Contractors only felt strong association with the ***Time*** and ***Money*** variables, while owners and consultants felt strong association with all eight variables, especially on ***Quality*** and ***Operation***.

4- In the 'contract administration group' of claims Table (8-2) contractors felt the greatest association with the eight variables followed by owners, while consultants felt the least association.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Owners** | 18.4 | 16.8 | 2.8 | - | - | - | 6.0 | 2.8 | **46.8** |
| **Contractors** | 28.6 | 18.5 | 7.9 | - | - | - | 4.1 | 9.3 | **68.4** |
| **Consultants** | 9.5 | 9.6 | 4.6 | 3.7 | - | - | 3.3 | 3.9 | **34.6** |
| **Total** | **56.5** | **44.9** | **15.3** | **3.7** | - | - | **13.4** | **16.0** | **149.8** |

**Table (8-2) Total weight of association with the eight variables by the Contract Administration group of claims regarding Party to the project.**

5- The highest associated variables were ***Time*** followed by ***Money***. Contractors felt the highest association with ***Time*** followed by owners, while consultants were the least associated. Again contractors felt the highest association with the ***Money*** variable followed closely by owners, while consultants were the least impacted. The latter were the only party associated with the ***Quality*** factor.

### 8.3.2) Ownership of a project

1- It was noticed from the data that the 'information based' claim group had a stronger association with the eight variables than the 'contract administration' group of claims Table (8-4).

2- Private projects felt a stronger association with the 'information based' group of claims than the government projects.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Government** | 11.6 | 12.3 | 6.6 | - | - | - | 3.2 | 3.2 | **36.9** |
| **Private** | 12.7 | 11.2 | 10.4 | 12.3 | 5.5 | 5.9 | 10.6 | 10.1 | **78.7** |
| **Total** | **24.3** | **23.5** | **17.0** | **12.3** | **5.5** | **5.9** | **13.8** | **13.3** | **115.6** |

**Table ( 8-3 )Total weight of association with the eight variables by the Information- Based group of claims regarding Ownership.**

3- ***Time*** was the highest affected variable followed by the ***money*** variable.

4- Private projects felt a stronger association with ***Time*** than the government projects while the association with the ***Money*** variable was almost the same on both ownerships. All eight variables were strongly associated with private projects while public ones felt no strong associated with the ***Quality***, ***Function*** or ***Life Expectancy*** variables.

5- In the 'contract administration' group of claims, private projects felt almost double the weight of association with government ones, Table (8-3). The effect on ***Time*** in private projects was more than double that in government projects. Also the ***Money*** variable was more associated with private projects than in government ones. The same applies to the ***Operation*** variable. Government projects had no strong association with the ***Quality*** and ***Life Expectancy*** variables. Both types of ownership felt no weight of association with the ***Function*** variable.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Government** | 10.3 | 14.5 | 4.7 | - | - | - | 3.9 | 5.0 | **38.4** |
| **Private** | 25.3 | 18.6 | 11.8 | 3.2 | - | 2.6 | 6.0 | 6.0 | **73.5** |
| **Total** | **35.6** | **33.1** | **16.5** | **3.2** | - | **2.6** | **9.9** | **11.0** | **11.9** |

**Table ( 8-4 )Total weight of association with the eight variables by the Contract Administration group of claims regarding Ownership.**

### 8.3.3) Size of a project

1- The data showed that the 'information based' group of claims had a stronger weight of association with the eight variables than the 'contract administration' group of claims had.

2- It was shown that in this claim group of 'information' the larger the project size, the more association there will be with the eight variables. Table (8-5).

3- The highest associated variable was ***Time*** followed by ***Money*** and ***Operation***. The larger the project, the more the association with the ***Time*** variable. The same applies on the ***Money*** and ***Operation*** variables. There were no strong weight of association with the ***Function*** variable in large and medium projects, and no association with the ***Life Expectancy*** variable in medium size projects. The weight of association with the ***Reputation*** and ***Future Relations*** variables were high in large size projects. The effect on the ***Quality*** variable in small projects was high; over double that on medium and large projects.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Small** | 25.2 | 19.3 | 10.3 | 15.0 | 6.1 | 6.6 | 7.7 | 7.1 | **97.3** |
| **Medium** | 38.1 | 31.1 | 11.6 | 6.3 | - | - | 8.4 | 9.1 | **104.6** |
| **Large** | 59.0 | 41.4 | 30.8 | 7.0 | - | 2.9 | 22.1 | 23.3 | **186.5** |
| **Total** | **122.3** | **91.8** | **52.7** | **28.3** | **6.1** | **9.5** | **38.2** | **39.5** | **388.4** |

**Table ( 8-5 )Total weight of association with the eight variables by the Information Based group of claims regarding Size of project.**

4- In the 'contract administration' group of claims it was shown that the highest associated size of project was the medium size, followed closely by the large size. Small sized projects were only associated as one third of the association with medium or large sized projects. Table (8-6).

5- The highest impacted variable was ***Time*** followed by ***Money***. ***Reputation*** and ***Operation*** followed with almost equal association. The ***Future relations factor*** came later with weaker association with ***Life expectancy*** and ***Quality***. No association was noticed on the ***Function*** variable.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Small** | 6.9 | 7.6 | 3.2 | 3.7 | - | 2.9 | 3.2 | - | **27.5** |
| **Medium** | 38.7 | 24.1 | 15.8 | - | - | - | 6.7 | 13.5 | **98.8** |
| **Large** | 25.4 | 24.8 | 13.0 | - | - | 2.9 | 10.5 | 18.7 | **95.3** |
| **Total** | **71.0** | **56.5** | **32.0** | **3.7** | - | **5.8** | **20.4** | **32.2** | **221.6** |

**Table (8-6 ) Total weight of association with the eight variables by the Contract Administration group of claims regarding Size of project.**

## 8.4) Highest weight of association with the variables

Choosing the highest weight of association with the eight variables to demonstrate the strongest effects by claim causes the data shows the following:

### 8.4.1) Strongest effects on the party to a project.

#### i. Owners

Owners were largely affected by the 'information based' claims group followed by the 'contract administration' claims group Fig (8-1), Table (8-7) and (8-8). The former group had around three times more weight of association with owners than the latter. The three highest association with the 'information based' claim group

were by defective work by contractor followed by poor contractor's skills and poor contractor's management. The claim on defective contractor's work had an association with all eight variables especially on the ***time*** and ***money*** variables. The other two claim causes had an association with all eight variables except the ***function*** and the ***life expectancy*** variables, with the ***time*** and ***money*** variables especially highly associated, followed by the ***operation*** and ***quality*** variables.

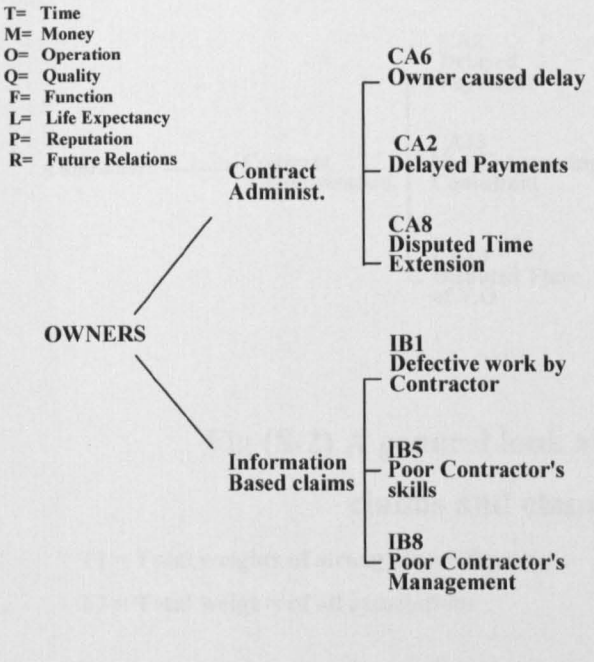
| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Owners** | 10.0 | 7.6 | 2.8 | - | - | - | 3.2 | 2.8 | **26.4** |
| **Contractors** | 16.5 | 10.6 | 7.9 | - | - | - | 4.1 | 9.3 | **48.4** |
| **Consultants** | - | - | - | - | - | - | - | - | - |
| **Total** | **26.5** | **18.2** | **10.7** | - | - | - | **7.3** | **12.1** | **74.8** |

**Table (8-7): Strong weight of association with the eight variables by the Contract Administration group of claims regarding Party to the project.**

In the 'contract administration' claim group, owners felt the strongest weight of association with owner caused delays followed by delayed payments and finally by disputed time extensions claims. From table (8-8) owner caused delays were highly associated with the ***time*** and ***money*** variables as well as the ***reputation*** of the parties' variable. The delayed payments claim were associated with the ***time*** and ***money*** variables as well, while the disputed ***time*** extension claim was strongly associated with the ***time*** and ***operation*** variables.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Owners** | 13.6 | 13.2 | 11.2 | 11.6 | 3.2 | 3.6 | 11.2 | 10.4 | **78.0** |
| **Contractors** | - | - | - | - | - | - | - | - | - |
| **Consultants** | 15.6 | 13.9 | 13.5 | 14.3 | 3.3 | 9.7 | 13.1 | 12.1 | **95.5** |
| **Total** | **29.2** | **27.1** | **24.7** | **25.9** | **6.5** | **13.3** | **24.3** | **22.5** | **173.5** |

**Table (8-8): Strong weight of association with the eight variables by the Information-Based group of claims regarding Party to the project.**




| *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *T1* | *T2* |
|---|---|---|---|---|---|---|---|---|---|
| x | x | | | | | x | | 10.0 | 19.6 |
| x | x | | | | | | | 10.4 | 19.2 |
| x | | x | | | | | | 6.0 | 17.2 |
| | | | | | | | | 26.4 | 56.0 |
| x | x | x | x | x | x | x | x | 32.8 | 32.8 |
| x | x | x | x | | | x | x | 24.8 | 29.6 |
| x | x | x | x | | | x | x | 20.4 | 24.4 |
| | | | | | | | | 78.0 | 86.8 |

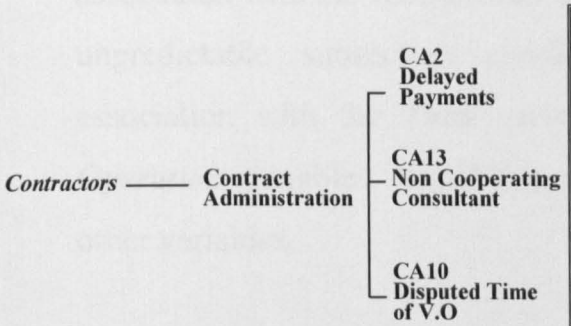
**Fig (8-1) A general look at** associations **and their weights by claims and claim groups on Owners.**

**T1 = Total weights of strong** associations **( x )**

**T2 = Total weights of all** associations

## ii. Contractors

The data shows that contractors were largely affected only by the 'contract administration' claim group Fig (8-2) Table (8-7) and (8-8). The highest association with contractors was by the delayed payment claim which was largely associated with the ***Time*** and ***Money*** variables followed by the ***Future Relations*** variable. The second highest association was by the claim on the non-cooperating consultant, which was highly associated with the ***Time*** variable followed by the ***Money*** variable and also associated with the ***Operation*** and ***Future Relations*** variables. The third strongest effect on contractors in this claim group was by the disputed time of variation orders; this claim had a strong association with the ***Time*** variable only.




| *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *T1* | *T2* |
|---|---|---|---|---|---|---|---|---|---|
| x | x | x | | | | x | x | 26.1 | 31.0 |
| x | x | x | | | | | x | 18.3 | 26.9 |
| x | | | | | | | | 4.1 | 19.6 |
| | | | | | | | | 48.5 | 77.5 |

**Fig (8-2) A general look at associations and their weights by claims and claim groups on Contractors.**

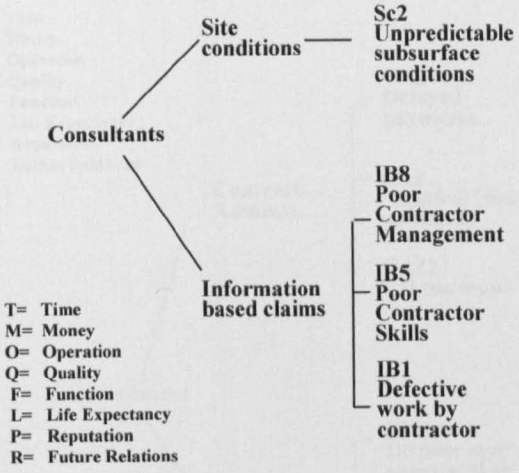
**T1 = Total weights of strong associations ( x )**

**T2 = Total weights of all associations**

### iii. Consultants

This group was strongly affected by the 'information based' group of claims followed by the 'site condition' group Fig (8-3). In the 'information based' group of claims effect was ten times that on the 'site condition' group. The highest in the group was the claim on poor contractor's management followed by poor contractor's skills and defective work by contractor. The weight of association of poor contractor's management with the ***time*** variable was the highest followed by association with the ***money*** variable and all other remaining variables. The poor contractors' skills claim was strongly associated with the ***time***, ***money***, ***operation*** and ***reputation*** variables. The association of defective work by contractor was strong with the ***Time*** and ***Operation*** variables, followed by ***Money*** and ***Quality***. It was also associated with the ***reputation***, ***future relations*** and the ***life expectancy*** variables. The last two claims had no strong association with the ***function*** variable. The 'site conditions' claim group had a strong weight of association with consultants but by far less than that

association with the 'information' based group of claims. The claim on unpredictable subsurface conditions had a strong weight of association with the ***Time*** variable, followed by the ***Money*** and ***Operation*** variables. It did not have a strong association with the other variables.




| *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *T1* | *T2* |
|---|---|---|---|---|---|---|---|---|---|
| x | x | x | | | | | | 9.9 | 18.2 |
| | | | | | | | | 9.9 | 18.2 |
| x | x | x | x | x | x | x | x | 37.1 | 37.1 |
| x | x | x | x | | x | x | x | 32.1 | 34.9 |
| x | x | x | x | | x | x | x | 26.3 | 20.9 |
| | | | | | | | | 95.5 | 100.9 |

**Fig (8-3) A general look at** associations **and their weights by claims and claim groups on Consultants.**

**T1 = Total weights of strong associations ( x )**

**T2 = Total weights of all associations**

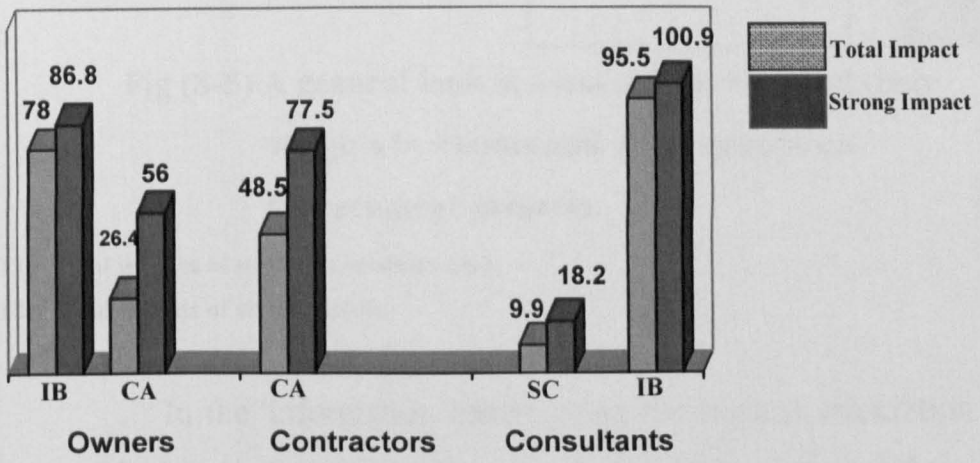



**Fig (8-4) Weights of all Strong associations of claim groups with party to a project**

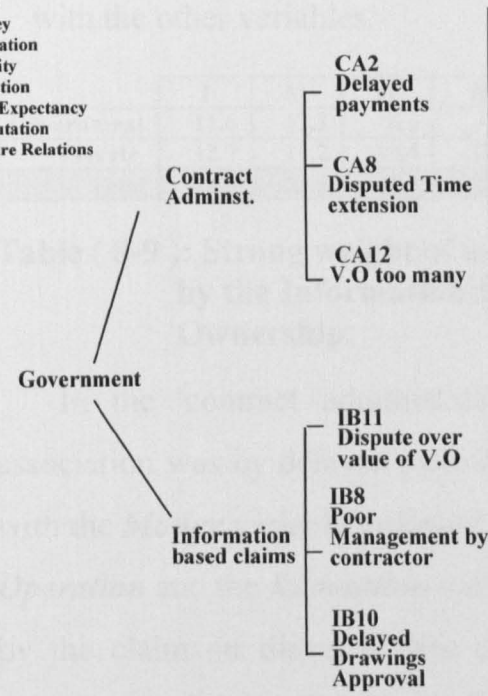
**CA = Contract Administration group**
**IB = Information-Based group**
**SC = Site Conditions-Based group**

### 8.4.2) Strongest effects on the Ownership of a project.

#### i. Government projects

The data showed that government projects were almost equally affected by the 'information based' group and the 'contract administration' based group of claims Fig (8-5).

T= Time
M= Money
O= Operation
Q= Quality
F= Function
L= Life Expectancy
P= Reputation
R= Future Relations




| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *T1* | *T2* |
|---|---|---|---|---|---|---|---|---|---|---|
| CA2 Delayed payments | x | x | x | | | | x | x | 27.8 | 34.3 |
| CA8 Disputed Time extension | x | | | | | | | | 3.7 | 17.3 |
| CA12 V.O too many | | x | | | | | | | 3.7 | 15.5 |
| | | | | | | | | | 35.2 | 67.1 |
| IB11 Dispute over value of V.O | x | x | x | | | | x | x | 19.0 | 26.4 |
| IB8 Poor Management by contractor | x | x | x | | | | | | 11.3 | 22.6 |
| IB10 Delayed Drawings Approval | x | x | | | | | | | 7.3 | 20.8 |
| | | | | | | | | | 37.6 | 69.8 |

**Fig (8-5) A general look at associations with and their weights by claims and claim groups on Government projects.**

**T1 = Total weights of strong associations ( x )**

**T2 = Total weights of all associations**

In the 'information based' group the highest association was with the claim on dispute over value of variation orders. The highest association with this claim was with the ***Money*** factor followed by the ***Time*** and the ***Operation***, ***Reputation*** and ***Future relations*** variables. The second affect was by the claim on poor

management by contractor which was strongly associated with the ***Time*** variable followed by the ***Money*** and ***Operation*** variables. The third strongest effect on government projects in this 'information group' was by the claim on delayed approval of drawings, which was associated with the ***Money*** variable slightly stronger than the ***Time*** variable, while it had no strong associated with the other variables.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Government** | 11.6 | 12.3 | 6.6 | - | - | - | 3.2 | 3.2 | **36.9** |
| **Private** | 12.7 | 11.2 | 10.4 | 12.3 | 5.5 | 5.9 | 10.6 | 10.1 | **78.7** |
| **Total** | **24.3** | **23.5** | **17.0** | **12.3** | **5.5** | **5.9** | **13.8** | **13.3** | **115.6** |

**Table ( 8-9 ): Strong weight of association with the eight variables by the Information-Based group of claims Regarding Ownership.**

In the 'contract administration' group of claims the highest association was by delayed payments which were strongly associated with the ***Money*** variable followed by ***Time*** and then ***Future relations***, ***Operation*** and the ***Reputation*** variables. The second strong effect was by the claim on disputed time extension which was only strongly associated with the ***Time*** variable. The third strongest effect in this claim group was by the claim on too many variation orders which only had strong association with the ***Money*** variable.

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Government** | 10.3 | 11.3 | 4.7 | - | - | - | 3.9 | 5.0 | **35.2** |
| **Private** | 11.2 | 10.5 | 9.2 | 3.2 | - | 2.6 | 6.0 | 6.0 | **48.7** |
| **Total** | **21.5** | **21.8** | **13.9** | **3.2** | - | **2.6** | **9.9** | **11.0** | **83.9** |

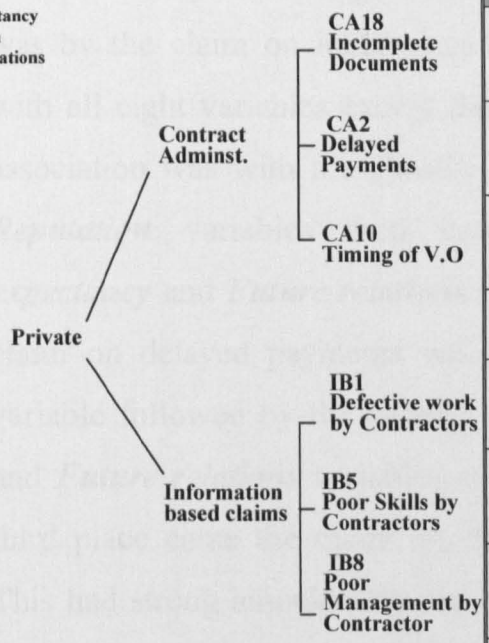
**Table ( 8-10 ): Strong weight of association with the eight variables by the Contract Administration group of claims regarding Ownership.**

### ii. Private projects

The data showed that private projects were strongly affected by the 'information based' claims group, followed by the 'contract

administration' group. The former had 60% more effect than the latter. Fig (8-6).

T= Time
M= Money
O= Operation
Q= Quality
F= Function
L= Life Expectancy
P= Reputation
R= Future Relations




| | T | M | O | Q | F | L | P | R | T1 | T2 |
|---|---|---|---|---|---|---|---|---|---|---|
| CA18 Incomplete Documents | x | x | x | x | | x | x | x | 20.4 | 22.3 |
| CA2 Delayed Payments | x | x | x | | | | x | x | 18.9 | 23.7 |
| CA10 Timing of V.O | x | x | x | | | | | | 9.4 | 18.8 |
| | | | | | | | | | 48.7 | 64.8 |
| IB1 Defective work by Contractors | x | x | x | x | x | x | x | x | 29.3 | 29.3 |
| IB5 Poor Skills by Contractors | x | x | x | x | x | x | x | x | 29.1 | 29.1 |
| IB8 Poor Management by Contractor | x | x | x | x | | | x | x | 20.3 | 24.7 |
| | | | | | | | | | 78.7 | 83.1 |

**Fig ( 8-6 ) A general look at associations and their weights by claims and claim groups on Private projects.**

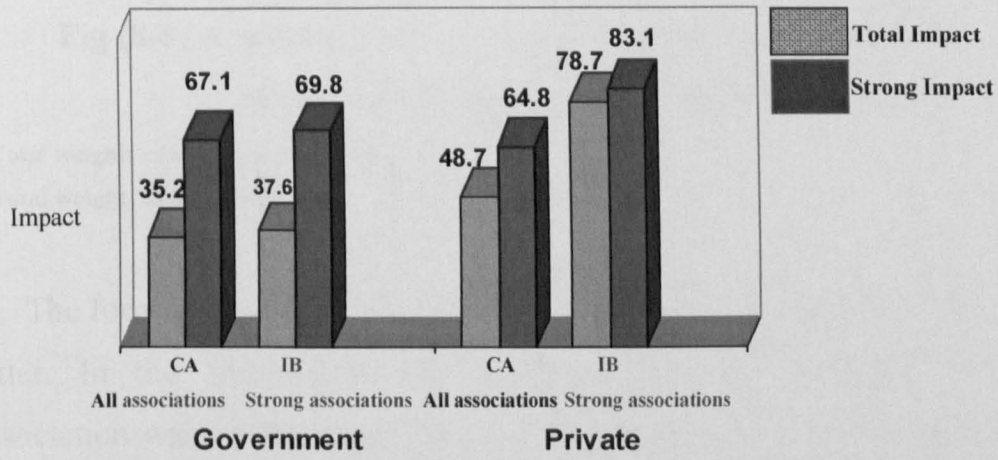
**T1 = Total weights of strong associations ( x )**

**T2 = Total weights of all associations**

In the 'information based' claim group the strongest effect was by the claim on defective work by the contractors. It had strong association with all eight variables, with the strongest association with ***Time***, ***Quality***, ***Money*** and ***Operation***. Almost equally strong is the claim on poor skills by contractor. This claim too had strong association with all eight variables with the strongest on ***Quality***, ***Time*** and ***Money***. The association with ***Reputation*** is the strongest of the remaining variables. In third place came the claim on poor management by contractor. This claim had strong association with six out of the eight variables, with the strongest association with the ***Time***

variable, followed by ***Quality***, ***Money***, and ***Reputation***. ***Future relations*** came next followed by the ***Operation*** variable.

In the 'contract administration' claim group, the strongest effect was by the claim on incomplete documents which was association with all eight variables except the ***Function*** variable. The strongest association was with the ***Quality*** variable, followed by ***Money*** and ***Reputation*** variables then came the ***Time***, ***Operation***, ***Life expectancy*** and ***Future relations*** variables. In second place came the claim on delayed payments which was association with the ***Time*** variable followed by the ***Money*** variable, then came the ***Operation*** and ***Future relations*** variables and then the ***Reputation*** variable. In third place came the claim on disputed timing of variation orders. This had strong associations with the ***Time*** variable followed by the ***Money*** and ***Operation*** variables. It had no strong association with the other variables.




**Fig(8-7) weights of Associations of claim groups with Ownership of a project**

**CA = Contract Administration group**
**IB = Information-Based group**

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Small** | 12.4 | 12.4 | 10.3 | 11.8 | 6.1 | 6.6 | 7.7 | 7.1 | **74.4** |
| **Medium** | 9.5 | 7.4 | 6.0 | 6.3 | - | - | 5.6 | 6.3 | **41.1** |
| **Large** | 13.1 | 13.2 | 10.2 | 7.0 | - | 2.9 | 10.2 | 10.5 | **67.1** |
| **Total** | **35.0** | **33.0** | **26.5** | **25.1** | **6.1** | **9.5** | **23.5** | **23.9** | **182.6** |

**Table ( 8-11): Strong weight of association with the eight variables by the Information-Based group of claims regarding Size of project.**

In second place came the claim on defective work by contractor which similarly was strongly associated with all eight variables. The strongest association was with ***Time*** and ***Quality***, followed by ***Money***, ***Operation***, ***Reputation***, ***Future relations*** and then by the ***Function*** and ***Life expectancy*** variables. The third strongest claim cause was that of poor management by contractor, which was strongly associated with the ***Time*** and ***Money*** variables, followed by ***Quality*** and ***Operation***. In the 'contract administration' group of claims there were only two claims with strong effects on small size projects.

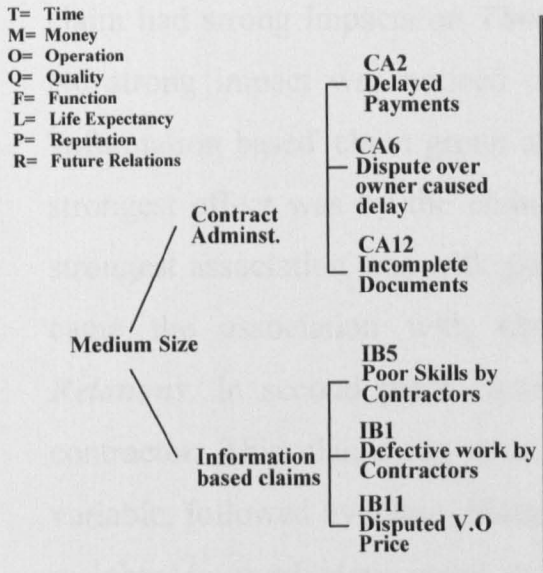
| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Small** | 6.9 | 7.6 | 3.2 | 3.7 | - | 2.9 | 3.2 | - | **27.5** |
| **Medium** | 13.5 | 13.5 | 11.4 | - | - | - | 6.7 | 7.2 | **52.3** |
| **Large** | 15.5 | 14.6 | 13.0 | - | - | 2.9 | 10.5 | 12.3 | **68.8** |
| **Total** | **35.9** | **35.7** | **27.6** | **3.7** | **-** | **5.8** | **20.4** | **19.5** | **148.6** |

**Table (8-12): Strong weight of association of the eight variables with the Contract Administration group of claims regarding Size of project.**

The stronger was that on incomplete contract documents. It had strong associations on six out of the eight variables. The strongest association was with ***Money*** and ***Quality*** followed by ***Time***, ***Operation*** and ***Reputation***. The last associated variable was ***Life Expectancy***, while there were no strong associations with the ***Function*** and ***Future relations*** variables. The claim on delayed payments came second with strong associations with only two out of the eight variables; ***Money*** followed by ***Time***.

### ii. Medium projects (5-20 million SR)

The data showed that medium sized projects were strongly affected by the two major claim groups out of the six claim groups previously discussed. Fig (8-9).




| T | M | O | Q | F | L | P | R | T1 | T2 |
|---|---|---|---|---|---|---|---|---|---|
| x | x | x | | | | x | x | 20.3 | 24.0 |
| x | x | x | | | | x | x | 16.2 | 20.9 |
| x | x | x | | | | | | 15.7 | 25.3 |
| | | | | | | | | 52.2 | 70.2 |
| x | | x | x | | | x | x | 15.1 | 20.1 |
| x | x | x | x | | | x | | 14.4 | 19.4 |
| x | x | | | | | | x | 11.6 | 21.2 |
| | | | | | | | | 41.1 | 60.7 |

**Fig (8-9) A general look at** associations **and their weights by claims and claim groups on Medium Size projects.**

**T1 = Total weights of strong associations ( x )**

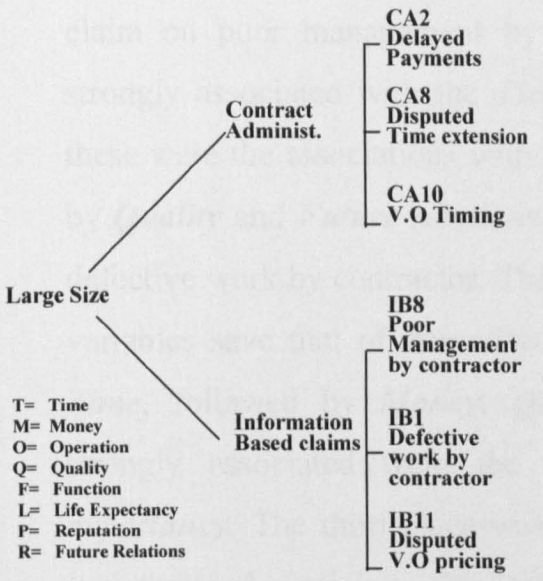
**T2 = Total weights of all associations**

The higher effect was by the 'contract administration' claim group, in contrast with small projects that felt the highest effect from the 'information based' claim group which came second in this medium sized project category. In the 'contract administration' claim group, the highest effect was by the claim on delayed payments which was strongly associated with the ***Time*** and ***Money*** variables. Then came the association with the ***Reputation*** variable and ***Future Relations***. ***Operation*** was in last place, with no strong association with ***Quality***, ***Function*** or ***Life expectancy***. In second place came the effect by the

claim on dispute over owner-caused delays. This claim strongly impacted the ***future relations***, followed by the ***Money*** and ***Operation*** variables, then ***Time*** and ***Reputation***. No strong association was noticed with ***Quality***, ***Function*** or ***Life expectancy***. The third claim with strong associations was that with too many variation orders. This claim had strong impacts on ***Time*** followed by ***Money*** and ***Quality***. No strong impact was noticed on the other five variables. In the 'information based' claim group affecting medium sized projects, the strongest effect was by the claim on poor skills of contractor. The strongest association was with ***Quality*** followed by ***Time***. Following came the association with ***Operation***, ***Reputation*** and ***Future Relations***. In second place came the claim on defective work by contractor. This claim was strongly associated with the ***Operation*** variable, followed by ***Time***, ***Money***, ***Quality*** and ***Reputation*** in equal weights. In third place came the claim on disputes over variation order pricing. This had strong association with ***Money***, followed equally by ***Time*** and ***Future Relations***. The data showed that the frequency of association in medium sized projects was highest with the ***Time*** variable followed equally by ***Money*** and ***Operation***, with ***Future relations*** in the third place.

### iii. Large projects (over 20 million SR)

The data showed that large sized projects were almost equally affected by the 'contract administration' and 'information based' claim groups, in contrast to medium size projects and to small projects as well, Fig (8-10).




| *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *T1* | *T2* |
|---|---|---|---|---|---|---|---|---|---|
| x | x | x | | | | x | x | 32.5 | 39.9 |
| x | x | x | | | x | x | x | 20.0 | 23.5 |
| x | x | x | | | | x | x | 16.3 | 23.7 |
| | | | | | | | | 68.8 | 87.1 |
| x | x | x | x | | | x | x | 24.0 | 29.2 |
| x | x | x | x | | x | x | x | 23.5 | 25.9 |
| x | x | x | | | | x | x | 19.6 | 26.8 |
| | | | | | | | | 76.1 | 81.9 |

**Fig (8-10) A general look at associations and their weights by claims and claim groups with Large Size projects.**

**T1 = Total weights of strong** associations **( x )**

**T2 = Total weights of all** associations

In the 'contract administration' claim group, the highest effect was by the claim on delayed payments. This claim was strongly associated with the ***Money*** variable, followed by ***Time***, ***Operation*** and ***Future relations***, and to a lesser extent the ***Reputation*** variable. No strong association was noticed on ***Quality***, ***Function*** or ***Life expectancy***. In second place came the claim on disputed time extension. This claim was strongly associated with ***Time*** followed by ***Operation***. Then came ***Reputation*** and ***Future relations***, followed by ***Money*** and ***Life expectancy***. No strong association was noticed on either the ***Quality*** or ***Function*** variables. In third place came the claim on timing of variation orders. This claim was strongly associated with the ***Time*** and ***Money*** variables, followed by ***Operation*** and ***Future relations***. The least strongly associated variable was ***Reputation***. In the

'information based' claim group, the highest association was with the claim on poor management by contractor. This claim cause was strongly associated with the ***Time*** and ***Money*** variables. Following these were the associations with ***Operation*** and ***Reputation*** followed by ***Quality*** and ***Future relations***. In second place came the claim on defective work by contractor. This claim was associated with all eight variables save that of ***Function***. Its association was strongest with ***Time***, followed by ***Money***, ***Quality*** and ***Future relations***. Less strongly associated were the variables of ***Operation*** and ***Life expectancy***. The third place was reserved for the claim on disputed variation order pricing. The strongest association was noticed with ***Money***, followed by ***Time***. Following came the associations with ***Operation***, ***Future relations*** and ***Reputation***. No strong associations were noticed on ***Quality***, ***Function*** and ***Life expectancy***. The data shows that the frequency of strong associations with large projects was evenly distributed between ***Time***, ***Money***, ***Operation***, ***Reputation*** and ***Future relations***. The frequency was low in ***Quality*** and ***Life expectancy***, and absent in the ***Function*** variable

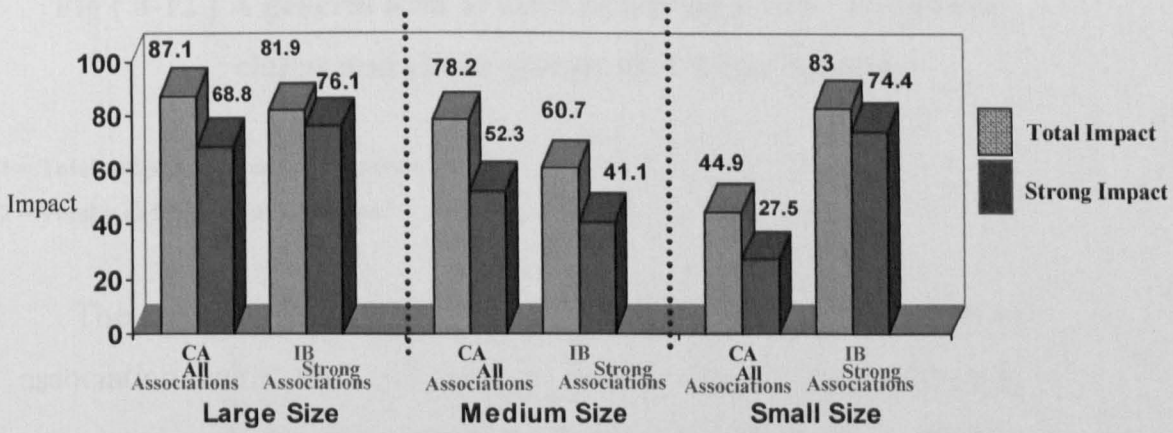


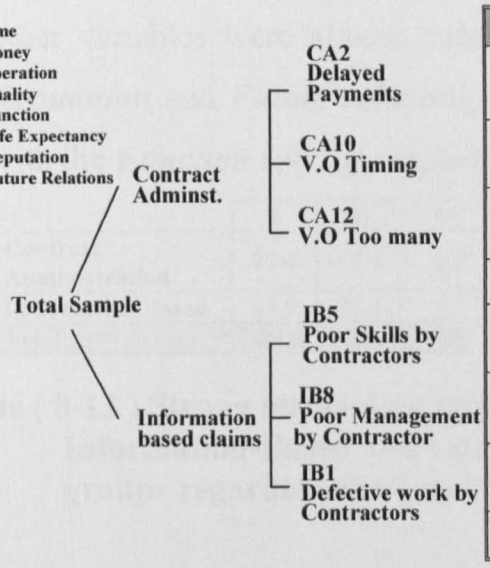

**Fig ( 8-11 ) Associations of claim groups with the size of the project.**

**CA = Contract Administration group**
**IB = Information-Based group**

**8.5) Strong effects on the Total Sample.**

It was evident from the data that the total sample was strongly associated with the two main claim groups; 'information based' and 'contract administration' claim groups. The 'information based' group had 63% higher weight of association than the 'contract administration' group. Fig (8-12)

T= Time
M= Money
O= Operation
Q= Quality
F= Function
L= Life Expectancy
P= Reputation
R= Future Relations




| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *T1* | *T2* |
|---|---|---|---|---|---|---|---|---|---|---|
| CA2 Delayed Payments | x | x | x | | | | x | x | 22.5 | 27.9 |
| CA10 V.O Timing | x | x | x | | | | | | 8.8 | 17.4 |
| CA12 V.O Too many | x | x | | | | | | | 5.9 | 14.8 |
| Contract Adminst. | | | | | | | | | 37.2 | 60.1 |
| IB5 Poor Skills by Contractors | x | x | x | x | | | x | x | 20.7 | 25.2 |
| IB8 Poor Management by Contractor | x | x | x | x | | | x | x | 19.6 | 24.5 |
| IB1 Defective work by Contractors | x | x | x | x | | | x | x | 20.0 | 23.9 |
| Information based claims | | | | | | | | | 60.3 | 73.6 |

**Fig ( 8-12 ) A general look at associations and their weights by claims and claim groups with Total Sample.**

**T1 = Total weights of strong associations ( x )**

**T2 = Total weights of all associations**

The claim on poor skills by contractor rated the highest weight of association with the 'information based' claim group, strongly associated with the ***Time***, ***Money***, ***Quality*** and ***Operation*** variables almost in similar values. The ***Reputation*** and ***Future relations*** variables were also strongly associated with it. No strong association was noticed on the ***Function*** and ***Life expectancy*** variables. In

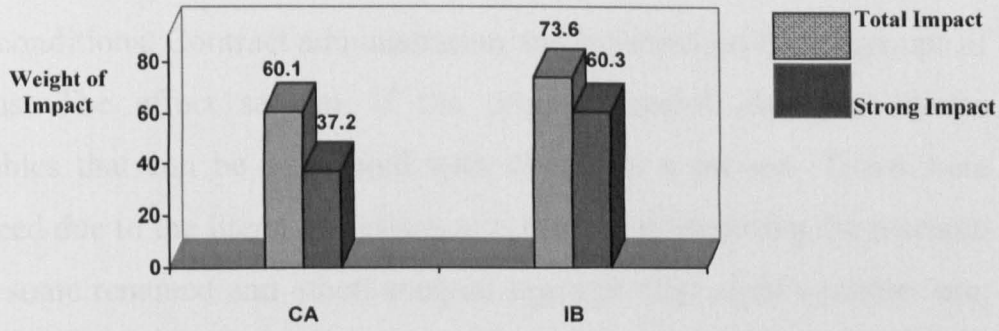
second place came poor management by contractor with a high association with ***Time*** followed by ***Money***. Almost equally associated are the variables of ***Operation***, ***Quality***, ***Reputation*** and ***Future relations***. The other two variables; ***Function*** and ***Life expectancy*** showed no strong associations. The third claim cause showing a strong association with the variables in this 'information based' claims group of claims is that on defective work by contractor. This had a strong association with ***Time*** followed by ***Quality*** and ***Money***. Three other variables were almost equally associated, namely ***Operation***, ***Reputation*** and ***Future relations***. No strong association was noticed with the ***Function*** and ***Life expectancy*** variables. Table (8-13)

| | T | M | O | Q | F | L | P | R | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Contract Administration** | 20.4 | 17.4 | 6.7 | - | - | - | 3.4 | 4.0 | **51.9** |
| **Information Based** | 25.9 | 29.2 | 9.7 | 10.2 | - | - | 9.5 | 12.0 | **96.5** |
| **Total** | **46.3** | **46.6** | **16.4** | **10.2** | - | - | **12.9** | **16.0** | **148.4** |

**Table ( 8-13 ) Strong association on the eight variables with the Information-Based and Contract Administration claim groups regarding the Total Sample.**

In the 'contract administration' group of claims the strongest association was noticed by the claim on delayed payments which scored a weight of association almost three times that of the second claim cause. This claim was strongly associated with the ***Money*** variable followed by the ***Time*** variable. Almost equally associated were the ***Future relations*** and ***Operation*** variables, followed by the ***Reputation*** variable. No strong association was noticed on the remaining three variables; ***Quality***, ***Function*** and ***Life expectancy***. The second claim cause was the timing of variation orders. This claim was strongly associated with the ***Time*** variable followed by the ***Money*** and ***Operation*** variables. All the five remaining variables were not strongly associated. The third claim cause of high weight is

that on too many variation orders. This claim was strongly associated with the ***Money*** variable followed closely by the ***Time*** variable. All the other variables were not strongly associated. It was seen from the data that the frequency of strong associations was equal between the ***Time*** and ***Money*** variables, followed by ***Operation***, ***Future relations*** and ***Reputation***. The frequency of strong associations in ***Quality*** was less than the former, while no strong weight of association was noticed in the ***Function*** and ***Life expectancy*** variables.




**CA = Contract Administration group**
**IB = Information-Based group**

**Fig ( 8-13 ) Weight of association of claim groups with the Total Sample.**

## 8.6) Revisiting the model

After getting to the conclusions in this research, revisiting the model that was designed earlier on Fig (8-14) is quite beneficial in order to compare the original and the outcome of this research. The sources of claims which were extended in the original model into client's team and contractor's team plus the financier of the project, have been modified into the three major parties in a project; owner (client), contractor and consultant. The original model had the consultant within the client's team, but during the research they were split into two major parties. The contractor in the original model was leading a group including sub

contractors, suppliers and others, but during the research this was simplified to the contractor only as a major party, while the others can be investigated in a separate research. On the causes of claims in the original model, contracts were identified as a major source of claims. During the research this was not considered, as this can be the topic of a separate research, due to time and resource constraints. Three claim groups were identified in the original model; 'Acts of God', 'Force Majeure' and Other. During the course of this research the last group (other) was enlarged and replaced by four claim groups due to the literature review; Market-driven, Site conditions, Contract administration and Information-based groups of claims. The effect section of the original model identified eleven variables that can be associated with claims in a project. These were reduced due to the literature review to eight variables during the research with some renamed and others merged together. The eight variables are: Time, Money, Operation, Quality, Function, Life Expectancy, Reputation and Future Relations. A new model is redesigned due to the previous development during the research. The new model shown in Fig (8-14) represents the final research variables and is modified according to the development of this research.

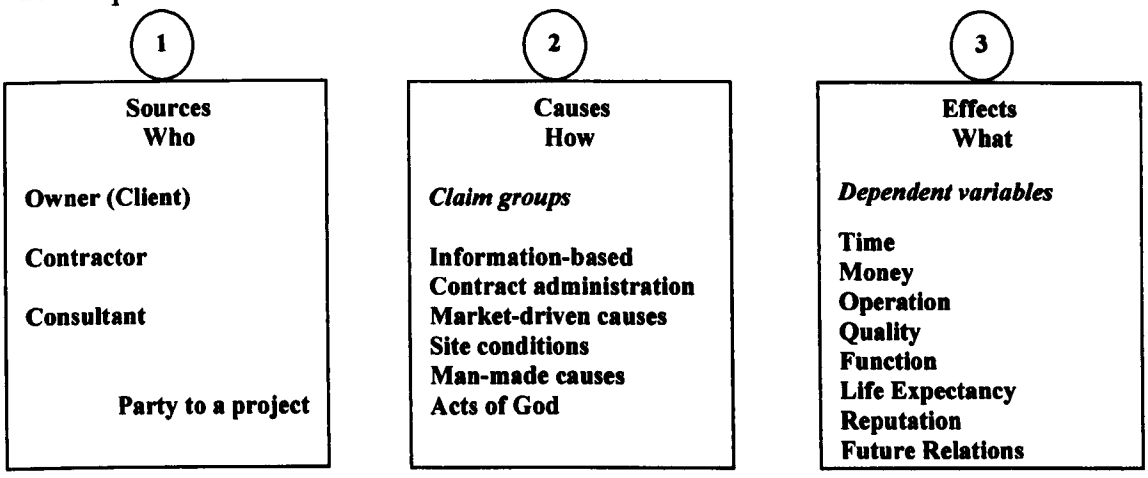



**Fig (8-14): Final Research Model**

## 8.7) Contribution to new knowledge

This thesis has added new knowledge in some way by identifying and grouping eight variables that are usually affected by claims in a project. These variables were: ***time***, ***money***, ***operation***, ***quality***, ***function***, ***life expectancy***, ***reputation*** and ***future relations***. These were further sub grouped into three sub groups: the process group (***time*** and ***money***) the product group (***operation***, ***quality***, ***function*** and ***life expectancy***) and the business consequences group (***reputation*** and ***future relations***). This is a new grouping of the variables. The thesis also identified the most associated variables and the magnitude of weight of association, which is also a new contribution. Eighty two heads of claims were recorded in this thesis and grouped under six main claim groups ('acts of god', 'site conditions', 'market driven', 'man-made', 'contract administration'-based and 'information and technical'-based claims). This is a new grouping, and this thesis has identified the most heavily associated claim groups out of these six, which in itself is another contribution. This research concentrated on three axes of independent variables that will affect the claim and its intensity: the party to a contract (owner, consultant and contractor), the ownership of a project (government or private), and the size of a project (small, medium or large). When discussing any one independent variable, this thesis came to identify, for every variable, the expected claim group(s) that will most likely be associated with this project, the heads of claim most likely to be raised, the dependent variable(s) that will be associated and the intensity of this weight of association. This is a new approach, and a new contribution to knowledge. Regarding the Saudi construction industry, this thesis gave coverage of the Saudi general environment and the local construction and legal environments. This research has highlighted the areas of the Saudi construction industry that need care, improvement and upgrade, and will

help improve the environment of work in construction in the country. Future research in the same area will be easier based on the easy and robust methodology laid down in this thesis.

## 8.8) Recommendations for Future Practice

From this research some recommendations can be put up for practitioners, clients (either private or government), and for future construction education in Saudi Arabia.

For clients it is evident that they have to pay more attention to timely payments to contractors and settle all money claims generally, and particularly those on variation orders, as quickly as they can to avoid complications in their relationship with contractors. To contractors in Saudi Arabia this research recommends that they must upgrade their technical capabilities and skills, they must pay attention to their managerial and administrative skills, and they should know that clients as well as consultants are dissatisfied with their abilities in this regard and complain of their output in their projects in small as well as medium and large projects. To consultants this research recommends that they take a more balanced role in their job of construction supervision. Contractors suffer from the incorporating engineer, who thinks that by being tough with contractors he is pleasing his client, yet not fully aware of the effect of his incorporation on the outcome of the project in regard to cost, time and quality.

For clients in the government owned projects this research recommends that they speed up with payments to contractors in order to avoid negative effects on time and cost of projects and in order to retain good future relations with contractors working for them. They must put more effort as well in settling claims on time extensions and try to

minimize the number of variation orders in their projects, of which most contractors are complaining. This necessitates more effort to be exerted during the design stage to limit the need for variations during the construction stage. Another recommendation for government clients is to speed up with settling money claims on variation orders by upgrading their administrative systems and by giving their consultants more authority in approving these money claims. These clients have to exert more effort on speeding the approval of drawings, which can easily be achieved through upgrading their management systems and employing better-trained consultants and giving them more authority in this regard. One last recommendation to government clients is to enhance their contractor selection techniques in order to select better contractors than are being selected at present and incorporate new criteria in the selection process that stresses on high management skills in contracting firms instead of only concentrating on technical skills as is the case at present. For clients in private owned projects the same recommendation on better selection of contractors applies here, plus better selection of consultants as well in order to upgrade the production of documents and better manage all claims especially those on variation orders.

Regarding clients in different sizes of projects, whether small, medium or large, they are all recommended to pay attention to timely payments to contractors as the association of time and money claims grows with the size of the project i.e. the larger the project the more likely their will be claims on time and cost associated with the delayed payments.

For the construction, education in Saudi Arabia this research recommends putting more emphasis on professional issues and on the issue of claims and their management and on the impact of claims on the outcome of projects regarding time, cost, quality and all other factors that

will be associated with claims. Some emphasis is to be put on studying the local environment and the construction environment in particular and not relying wholly on construction text books published in the Western world. Some hands on experience of on site management for under graduates as well as postgraduates would be helpful in preparing students for better managing future projects.

For professional societies in Saudi Arabia, this research recommends making exams mandatory for construction professionals whether working for clients, contractors or consultants. Memberships and fellowships through evaluation in professional societies are recommended, probably adapting those in the UK as a starting point.

## 8.9) Future Research Needs

Further research is possible on the same topic after identifying other independent factors (other than those addressed in this thesis). Factors like procurement methods and project delivery methods offer some area of research to identify what claims would arise out of each procurement method. The common design-bid-build versus the less common design-build arrangement will also pose an opportunity of investigation. The cost reimbursement method is another area to explore, with cost plus, lump sum or unit rate arrangements as independent factors to explore. Another area to explore is by researching with the selection techniques of contractors and consultants and their effect on the type and severity of claims. The contract model is another independent factor to be investigated. The local Public Works Contract (PWC) used in government projects is quite different from the less used international FIDIC model contract lately introduced to the private sector that lacks any model contract. The difference in claims generated from the previous

two contracts is still to be investigated. Some major factors discussed in this research might still be further investigated. Contractors are one factor, with the effect of those contractors employing a majority of expatriates whether Arabic speaking or other, of third world nationalities or other, and the differences in type of claim and weight of association in each case. The project as an independent factor can also be further investigated through comparison of kinds of claims and weight of association related to the geographical location of the project (whether Kingdom wide or over the Gulf region) and the kind of project (such as housing, utility, civil engineering etc...) and exploring the differences (if any) of claim causes and associations in every category.

## 8.10) Summary

It was noticed from the discussion in this chapter that whenever claims are 'information based', consultants were quite aware of the ***time*** variable while owners were aware of the ***money*** variable. Although contractors had an average awareness of the ***time*** and ***money*** factors, they had no awareness of the other six factors usually associated with claims in a project. Whenever claims are based on the management and 'contract administration' skills, contractors are the highest associated with the ***time*** and ***money*** factors. Private projects are more than double associated with claims than government projects. The later felt no association with ***quality***, ***function*** or ***life expectancy*** of the project which indicates that government projects are reaping the benefits of good supervision compared to private projects. The data showed that the larger the size of a project the more weight of association there will be due to claims on the eight dependant variables. The need for management and technical skills will be more as the size of the project grows. It was noticed that

contractors put all the blame on owners while owners do the same when it comes to the technical side of a job, and they relieve contractors of blame when it comes to the contract administration area of a project. Consultants put the blame on contractors when it comes to the technical part, while they feel no strong association with the 'contract administration' group of claims. Government projects have problems with both the technical and the administration groups of claims, while the problems with the technical side are huge in the private sector in comparison to the administration side. It is evident here that the private sector needs to upgrade its standards and output in the technical side of construction. The problems due to contractors are strongly manifested in the private sector and need prompt action to minimize their negative effect on the national construction industry. All sizes of projects had their major concern on the technical aspects and suffered from the poor output of contractors. Most of the problems in the Saudi construction industry came from the 'information and technical' based claims and to a lesser extent from the 'contract administration' based claims, with the poor performance by contractors taking centre stage. This necessitates immediate action to upgrade the majority of contractors in the market by the issuance of new regulatory legislation and a lot of educational remedies. There is a great concern in all projects primarily on the association with the process group of variables; ***time*** followed by the ***money*** variables. There are moderate concerns on the associations with the ***operation***, ***future relations***, ***reputation*** and ***quality*** variables, with no strong associations felt with the ***function*** or the ***life expectancy*** of a project which are a part of the product in a project.

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# Appendix (A)

# Chi-Square Calculation of Data

*Table Of General and Sub hypotheses ( Supported or Rejected )*

*General average of Effect for Different Types of Classifications*

*For different Groups*

| Groups | Owners | Contractors | Consultants | Less than 5 ml | From 5-20 ml | More than 20 ml | Government | Private | Total |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 25 | 29 | 46 | 38 | 28 | 34 | 38 | 62 | 100 |
| Acts of God | 0.09 | 0.09 | 0.09 | 0.08 | 0.06 | 0.14 | 0.08 | 0.10 | 0.09 |
| Man Made | 0.08 | 0.07 | 0.07 | 0.06 | 0.04 | 0.12 | 0.10 | 0.06 | 0.08 |
| Site Condition | 0.22 | 0.12 | 0.18 | 0.13 | 0.15 | 0.23 | 0.20 | 0.15 | 0.17 |
| Market Driven | 0.09 | 0.11 | 0.20 | 0.11 | 0.09 | 0.24 | 0.20 | 0.12 | 0.15 |
| Contract Administration | 0.32 | 0.40 | 0.36 | 0.26 | 0.41 | 0.44 | 0.35 | 0.37 | 0.36 |
| Information Based | 0.33 | 0.28 | 0.44 | 0.27 | 0.33 | 0.50 | 0.38 | 0.36 | 0.37 |
| Total | 0.27 | 0.26 | 0.34 | 0.22 | 0.28 | 0.40 | 0.31 | 0.29 | 0.30 |

**General Average of Effect = Total Effect / ( No. of questions within groups × No of Factors × Sample Size for each Category**

**Hypothesis Supported**

**Hypothesis Rejected**

*Table Of General and Sub hypotheses ( Supported or Rejected )*

*General average of Effect for Different Types of Classifications*

*For different Variables*

| Groups | Owners | Contractors | Consultants | Less than 5 ml | From 5-20 ml | More than 20 ml | Government | Private | Total |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 25 | 29 | 46 | 38 | 28 | 34 | 38 | 62 | 100 |
| Time | 0.38 | 0.42 | 0.47 | 0.31 | 0.46 | 0.55 | 0.45 | 0.42 | 0.43 |
| Money | 0.38 | 0.40 | 0.41 | 0.29 | 0.39 | 0.53 | 0.43 | 0.38 | 0.40 |
| Operation | 0.30 | 0.27 | 0.37 | 0.24 | 0.33 | 0.42 | 0.33 | 0.32 | 0.32 |
| Quality | 0.24 | 0.15 | 0.33 | 0.22 | 0.23 | 0.31 | 0.24 | 0.26 | 0.25 |
| Function | 0.15 | 0.13 | 0.24 | 0.15 | 0.15 | 0.26 | 0.18 | 0.19 | 0.19 |
| Life | 0.17 | 0.15 | 0.25 | 0.15 | 0.16 | 0.28 | 0.19 | 0.20 | 0.20 |
| Rep | 0.27 | 0.25 | 0.33 | 0.20 | 0.27 | 0.42 | 0.30 | 0.29 | 0.29 |
| Relation | 0.26 | 0.31 | 0.33 | 0.19 | 0.29 | 0.45 | 0.33 | 0.29 | 0.31 |
| Total | 0.27 | 0.26 | 0.34 | 0.22 | 0.28 | 0.40 | 0.31 | 0.29 | 0.30 |

**General Average of Effect = Total Effect / ( No. of questions within groups × No of Factors × Sample Size for each Category**

**Hypothesis Supported**

**Hypothesis Rejected**

# Appendix (B)

# Questionnaire and Frequency Distribution Tables

Dear colleague,

The construction industry today is complex and full of variables, which makes it a risky industry. There is a need to further study the claims arising in different projects to try to minimise them, which will have a positive effect on all the project parties. This attached questionnaire is part of a PhD. thesis in construction management at the University of Strathclyde in the UK, exploring claims and their impacts on the project parties in Saudi Arabia.

- Please, spare some time and fill in the questionnaire.
- Keep in mind one project in which there were claims, and fill in all sections of the questionnaire.

Thank you

Research Student
Nabil Abbas

*Causes of claims in the Construction Industry*

*in*

*Saudi Arabia*

- **Mark (X) as appropriate**

**Section one:**

❖ **Are you a:**

| | |
|---|---|
| Consultant | [ ] |
| Contractor | [ ] |
| Owner | [ ] |
| Sub-contractor | [ ] |
| Other (specify) | [ ] |

❖ **Project with any claims:**

| | |
|---|---|
| Private | [ ] |
| Government | [ ] |

❖ **Project value:**

In millions of SR .....

**Section two**
***Impact of Claim***

**Put (X) as appropriate for the impact:**

Weak = 1 average = 2 Strong = 3 Very strong = 4

| Impact | | Time | | | | Money | | | | Operation | | | | Quality | | | | Function | | | | Life Expectancy | | | | Reputation | | | | Future Relations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1-Claims on Acts of God** | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG01- Adverse weather conditions | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG02- Floods | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG03- Typhoons | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG04- Earthquakes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **2- Claims on Force Majeure** | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM01- War | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM02- Strikes | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM03- Fires | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM04- Pollution (water- gas- radiation) | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM05- Change in legislation | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **3- Claims on Site Conditions** | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC01- Restricted Access to Site | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC02- Unpredictable subsurface conditions | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC03- Cemetery or Historical Ruins on site | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC04- Disputed site ownership | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Impact | | Time | | | | Money | | | | Operation | | | | Quality | | | | Function | | | | Life Expectancy | | | | Reputation | | | | Future Relations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **4- Market-Driven Claims** | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD01- Inflation | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD02- Currency Fluctuation | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD03- Shortage of resources | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **5- Contract Administration Claims** | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA01- Poor coordination between contractors | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA02- Late payments by Owner | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA03- Late handing over of Site | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA04- Owner's failure to manage | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA05- Work stoppage by owner | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA06- Disputed compensation due to owner | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA07- Disputed compensation due to acceleration | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA08- Disputed time extension | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA09- Disputed variation order | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA10- Untimely variation order | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA11- Late payment of variation order | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA12- Too many variation orders | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA13- Un cooperating consultant | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA14- Poor documentation | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA15- Dispute resolution not specified in contract | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA16- Ambiguous contract documents | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA17- Contradicting contract documents | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA18- In complete contract documents | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA19- Insufficient contract period | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA20- Problems due to a Nominated Sub-contractor | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Impact | | Time | | | | Money | | | | Operation | | | | Quality | | | | Function | | | | Life Expectancy | | | | Reputation | | | | Future Relations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **6- Information and Technical-Based claims** | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-01 Defective work by contractor | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-02 Poor materials used | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-03 Poor quality/workmanship | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-04 Poor quality/machinery | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-05 Poor technical skills of contractor's team | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-06 Poor technical skills of owner's team | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-07 Poor technical skills of consultant's team | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-08 Poor management by contractor | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-09 Poor management by consultant | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-10 Low bidding by contractor | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-11 Dispute over additional or omitted work | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-12 Dispute during guarantee period | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-13 Late approval of drawings | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-14 Late approval of schedules | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-15 Late approval of materials | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-16 Late approval of work performed | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-17 Late approval of performance | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-18 Late approval of surveyed quantities | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-19 Late approval of productivity | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-20 Late approval of tests | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-21 Standard specifications not specified in contract | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-22 Unclear specifications | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-23 Contradicting specifications | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-24 Incomplete specifications | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Impact | | Time | | | | Money | | | | Operation | | | | Quality | | | | Function | | | | Life Expectancy | | | | Reputation | | | | Future Relations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **6- Information and Technical-Based claims** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-25 Late submittal of drawings by owner | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-26 Late submittal of drawings by consultant | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-27 Late submittal of drawings by contractor | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-28 Poor submittal by contractor of shop drawings | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-29 Poor submittal by contractor of AS-Built drawings | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-30 Poor submittal by contractor of schedules | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-31 Poor submittal by contractor of samples | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-32 Original design in compatible with local conditions | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-33 Original design in compatible with level of local contractors | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-34 Original design in compatible with level of local suppliers | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-35 Original design in compatible with level of local manufacturers | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-36 Original design has errors | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-37 Original design is incomplete | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-38 Original design is contradicting | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-39 Large differences between BOQ and actual quantities | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# Questionnaire

# Arabic Version

## مسببات المطالبات في صناعة التشييد
## في المملكة العربية السعودية

**ضع علامة (x) حسب المناسب :**

**القسم الاول :**

* هل انت:

| | |
|---|---|
| إستشاري | [ ] |
| مقاول | [ ] |
| مالك | [ ] |
| مقاول باطن | [ ] |
| آخر (حدد) | [ ] |

* هل كان المشروع الذي كان فيه مطالبات:

| | |
|---|---|
| خاص | [ ] |
| حكومي | [ ] |

* قيمة المشروع:

بملايين الريالات .....

**القسم الثاني:**

ضع علامة (x) كما هو مناسب على تلازم الأثر:

ضعيفة = ١ متوسطة = ٢ قوية = ٣ قوية جداً = ٤

| المؤثرات | | الوقت | | | | التكاليف | | | | التشغيل | | | | الجودة | | | | الوظيفة | | | | العمر الإفتراضي | | | | السمعة | | | | العلاقات المستقبلية | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ |
| (١) المطالبات المبنية على أفعال الله سبحانه | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG01 أحوال طقس معاكسة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG02 فيضانات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG03 عواصف | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AG04 زلازل | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (٢) المطالبات المبنية على القوى القاهرة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM01 الحرب | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM02 الاضرابات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM03 الحرائق | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM04 التلوث (الماء – الغاز – الإشعاع) | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FM05 التغيير في القوانين | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (٣) المطالبات المبنية على أحوال الموقع | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC01 وصول مقيد للموقع | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC02 أحوال تربة غير متوقعة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC03 وجود مقابر أو آثار بالموقع | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC04 نزاعات على ملكية الموقع | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| المؤثرات | الوقت | | | | التكاليف | | | | التشغيل | | | | الجودة | | | | الوظيفة | | | | العمر الإفتراضي | | | | السمعة | | | | العلاقات المستقبلية | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ |
| (٤) مطالبات مبنية على أحوال الموقع [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD01 التضخم [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD02 تذبذب العملات [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD03 نقص الموارد [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (٥) مطالبات مبنية على إدارة العقد [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA01 سوء التنسيق بين المقاولين [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA02 دفعات متأخرة من المالك [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA03 تأخر في تسليم الموقع [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA04 سوء إدارة المالك [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA05 إيقاف العمل من المالك [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA06 الخلاف على التعويضات بسبب المالك [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA07 الخلاف على التعويضات نتيجة التسارع [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA08 الخلاف على تحديد الوقت [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA09 الخلاف على الأعمال التغييرية [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA10 الخلاف على توقيت الأعمال التغييرية [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA11 تأخر في سداد الأعمال التغييرية [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA12 زيادة في عدد الأعمال التغييرية [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA13 عدم التعاون من الإستشاري [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA14 سوء حفظ المستندات [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA15 سبل حل المنازعات غير مذكور بالعقد [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA16 غموض في مستندات التعاقد [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA17 تضارب في مستندات التعاقد [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA18 نقص في مستندات التعاقد [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA19 مدة العقد غير كافية [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA20 مشاكل بسبب مقاول باطن معين [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| المؤثرات | | الوقت | | | | التكاليف | | | | التشغيل | | | | الجودة | | | | الوظيفة | | | | العمر الإفتراضي | | | | السمعة | | | | العلاقات المستقبلية | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ |
| (٦) المطالبات المبنية على الموضوعات الفنية والمعلومات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-01 أعمال خاطئة بواسطة المقاول | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-02 إستخدام مواد معيبة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-03 سوء المصنعية/ الجودة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-04 إستخدام معدات سيئة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-05 قدرات فنية سيئة من المقاول | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-06 قدرات فنية سيئة من المالك | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-07 قدرات فنية سيئة من الإستشاري | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-08 سوء إدارة من المقاول | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-09 سوء إدارة من الإستشاري | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-10 تسعير منخفض من المقاول | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-11 الخلاف على أعمال إضافية أو محذوفة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-12 الخلاف على أعمال أثناء فترة الضمان | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-13 التأخر في إعتماد الخرائط | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-14 التأخر في إعتماد الجداول | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-15 التأخر في إعتماد المواد | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-16 التأخر في إعتماد الأعمال المنفذة | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-17 التأخر في إعتماد الأداء | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-18 التأخر في إعتماد حصر الكميات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-19 التأخر في إعتماد معدلات الإنتاجية | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-20 التأخر في إعتماد الإختبارات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-21 المواصفات القياسية غير مذكورة بالعقد | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-22 غموض في المواصفات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-23 تضارب في المواصفات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-24 نقص في المواصفات | [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| المؤثرات | الوقت | | | | التكاليف | | | | التشغيل | | | | الجودة | | | | الوظيفة | | | | العمر الإفتراضي | | | | السمعة | | | | العلاقات المستقبلية | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ | ١ | ٢ | ٣ | ٤ |
| (٦) المطالبات المبنية على الموضوعات الفنية والمعلومات (تكملة) [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-25 تأخر المالك في تقديم الخرايط [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-26 تأخر الإستشاري في تقديم الخرايط [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-27 تأخر المقاول في تقديم الخرايط [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-28 سوء تقديم المقاول لرسومات الورشة [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-29 سوء تقديم المقاول لرسومات كما نفذ [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-30 سوء تقديم المقاول للجداول [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-31 سوء تقديم المقاول للعينات [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-32 التصميم الأصلي غير موافق للأحوال المحلية [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-33 التصميم الأصلي غير موافق لقدرات المقاولين المحليين [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-34 التصميم الأصلي غير موافق لقدرات الموردين المحليين [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-35 التصميم الأصلي غير موافق لقدرات المصنعين المحليين [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-36 أخطاء في التصميم الأصلي [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-37 نقص في التصميم الأصلي [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-38 تضارب في التصميم الأصلي [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IB-39 فروقات كبيرة بين الكميات في الجداول والطبيعة [ ] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## *Normalised Weights of Impacts*

# *Owners*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.6 | 1.6 | 2 | 2 | 0.8 | 1.2 | 1.6 | 1.6 | 12.4 |
| *AG-2* | | | | | | | | | |
| *AG-3* | | | | | | | | | |
| *AG-4* | | | | | | | | | |
| *Total* | 1.6 | 1.6 | 2 | 2 | 0.8 | 1.2 | 1.6 | 1.6 | 12.4 |
| *MM-1* | 0.8 | 0.8 | 0.8 | 0.8 | 0.4 | 0.8 | 0.8 | 0.8 | 6 |
| *MM-2* | | | | | | | | | |
| *MM-3* | | | | | | | | | |
| *MM-4* | | 0.4 | | | | | | 0.4 | 0.8 |
| *MM-5* | 0.8 | 1.2 | 0.8 | 0.4 | 0.4 | 0.4 | 0.4 | 0.8 | 5.2 |
| *MM-6* | 0.4 | 0.4 | 0.4 | 0.4 | 0.8 | | 0.4 | 0.4 | 3.2 |
| *Total* | 2 | 2.8 | 2 | 1.6 | 1.6 | 1.2 | 1.6 | 2.4 | 15.2 |
| *SC-1* | | | | | | | | | |
| *SC-2* | 2.4 | 4 | 2 | 1.6 | 1.2 | 1.2 | 2.4 | 2 | 16.8 |
| *SC-3* | | 0.4 | 0.8 | | | | | | 1.2 |
| *SC-4* | 1.6 | 1.2 | 2 | 0.8 | 0.8 | 1.6 | 1.6 | 1.6 | 11.2 |
| *Total* | 4 | 5.6 | 4.8 | 2.4 | 2 | 2.8 | 4 | 3.6 | 29.2 |
| *MD-1* | 0.8 | 1.2 | 0.8 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 4.8 |
| *MD-2* | 0.8 | 0.8 | 0.4 | | | | | | 2 |
| *MD-Man* | 0.8 | 0.8 | 0.8 | 0.4 | 0.4 | 0.8 | 0.8 | 0.8 | 5.6 |
| *MD-E* | 0.8 | 0.8 | 0.8 | 0.4 | 0.4 | 0.8 | 0.8 | 0.8 | 5.6 |
| *MD-M* | 0.8 | 0.4 | 0.4 | | | | | | 1.6 |
| *MD-P* | | 0.4 | | | | | | | 0.4 |
| *MD-T* | | 0.4 | | | | | | | 0.4 |
| *MD-else* | | | | | | | | | |
| *Total* | 4 | 4.8 | 3.2 | 1.2 | 1.2 | 2 | 2 | 2 | 20.4 |
| *CA-1* | 2.4 | 2 | 2 | 0.8 | 0.4 | 0.8 | 1.6 | 1.6 | 11.6 |
| *CA-2* | 3.2 | 4.4 | 6 | 1.6 | 0.8 | 1.6 | 2.4 | 2.8 | 22.8 |
| *CA-3* | 1.6 | 1.2 | 1.2 | | 0.4 | 0.8 | 0.8 | 0.4 | 6.4 |
| *CA-4* | 2.4 | 1.6 | 2 | 1.2 | 0.4 | 0.4 | 0.8 | 0.8 | 9.6 |
| *CA-5* | 1.2 | 0.8 | 0.8 | 0.4 | 0.4 | 0.8 | 0.4 | 0.4 | 5.2 |
| *CA-6* | 3.6 | 3.2 | 2.4 | 1.6 | 1.2 | 2 | 3.2 | 2.4 | 19.6 |
| *CA-7* | | 0.8 | | | | | | | 0.8 |
| *CA-8* | 3.2 | 2.4 | 2.8 | 1.6 | 0.8 | 1.6 | 2.4 | 2.4 | 17.2 |
| *CA-9* | 2 | 2.4 | 0.8 | 0.8 | 0.8 | 0.8 | 1.2 | 1.2 | 10 |
| *CA-10* | 2.8 | 2.4 | 2.4 | 1.6 | 1.2 | 0.8 | 1.6 | 1.6 | 14.4 |
| *CA-11* | 1.6 | 3.2 | 2.4 | 1.2 | 0.8 | 1.2 | 2.8 | 2.4 | 15.6 |
| *CA-12* | 1.6 | 2.8 | 1.6 | 0.8 | 0.8 | 0.8 | 1.2 | 1.6 | 11.2 |
| *CA-13* | 1.6 | 1.6 | 2 | 1.2 | 0.8 | 0.8 | 1.2 | 1.2 | 10.4 |
| *CA-14* | 0.8 | 1.2 | 0.8 | 0.8 | | | 0.8 | | 4.4 |
| *CA-15* | 0.8 | 0.4 | 0.4 | 0.8 | 0.4 | | 0.4 | 0.4 | 3.6 |
| *CA-16* | 0.8 | 1.6 | 1.6 | 0.8 | 0.8 | 3 | 0.8 | 1.2 | 10.6 |
| *CA-17* | 1.2 | 1.2 | 0.8 | | | | 0.8 | 0.8 | 4.8 |
| *CA-18* | 2.8 | 3.2 | 2.4 | 1.6 | 1.6 | 1.6 | 2 | 1.6 | 16.8 |
| *CA-19* | 2.8 | 2.4 | 1.2 | 1.2 | 1.2 | 1.6 | 1.6 | 1.6 | 13.6 |
| *CA-20* | 0.4 | 0.4 | | | | | 0.4 | 0.4 | 1.6 |
| *Total* | 36.8 | 39.2 | 33.6 | 18 | 12.8 | 18.6 | 26.4 | 24.8 | 210.2 |

## *Normalised Weights of Impacts*

## *Owners*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 4.8 | 4.4 | 3.2 | 4.8 | 3.2 | 3.6 | 4.4 | 4.4 | 32.8 |
| *IB-2* | 1.6 | 1.6 | | 1.6 | 2 | 0.4 | 1.2 | 0.8 | 9.2 |
| *IB-3* | 2.8 | 2.8 | 1.6 | 2.4 | 2.4 | 0.8 | 2.4 | 1.6 | 16.8 |
| *IB-4* | 0.8 | 0.8 | 0.8 | 0.4 | 0.4 | 0.4 | 0.8 | 0.8 | 5.2 |
| *IB-5* | 4.8 | 4.8 | 4.4 | 4 | 2.4 | 2.4 | 3.6 | 3.2 | 29.6 |
| *IB-6* | | | | | | | | | |
| *IB-7* | 1.6 | 1.6 | 1.2 | 0.8 | 0.4 | 0.4 | 0.8 | 1.2 | 8 |
| *IB-8* | 4 | 4 | 3.6 | 2.8 | 2 | 2 | 3.2 | 2.8 | 24.4 |
| *IB-9* | 0.8 | 0.8 | 0.8 | 0.8 | 0.4 | 0.4 | 0.8 | 0.8 | 5.6 |
| *IB-10* | 1.6 | 2.4 | 2 | 1.6 | 1.2 | 1.2 | 1.6 | 1.6 | 13.2 |
| *IB-11* | 3.2 | 3.6 | 2.8 | 1.2 | 1.2 | 1.6 | 1.6 | 1.6 | 16.8 |
| *IB-12* | 1.6 | 2 | 1.6 | 1.6 | 1.2 | 1.2 | 1.2 | 0.8 | 11.2 |
| *IB-13* | 2 | 1.6 | 1.6 | 0.8 | 0.8 | 0.4 | 1.2 | 1.6 | 10 |
| *IB-14* | 2.4 | 2 | 1.6 | 0.8 | 0.4 | 0.4 | 1.2 | 1.2 | 10 |
| *IB-15* | 2.4 | 2.4 | 1.6 | 0.8 | 0.8 | 1.2 | 1.6 | 1.6 | 12.4 |
| *IB-16* | 2 | 2 | 1.6 | 0.4 | | 0.4 | 1.6 | 1.6 | 9.6 |
| *IB-17* | 0.4 | 0.4 | | | | | | | 0.8 |
| *IB-18* | 1.6 | 1.2 | 0.8 | | | | 0.8 | 0.8 | 5.2 |
| *IB-19* | 0.8 | 0.8 | 0.4 | 0.4 | | 0.4 | 0.4 | 0.4 | 3.6 |
| *IB-20* | 3.2 | 2.4 | 2 | 1.2 | 0.8 | 1.2 | 2 | 1.6 | 14.4 |
| *IB-21* | | | | | | | | | |
| *IB-22* | 0.8 | 0.8 | 1.2 | 1.6 | 0.8 | 0.4 | 0.8 | 0.8 | 7.2 |
| *IB-23* | 1.6 | 1.6 | 1.6 | 0.8 | 0.4 | 0.4 | 1.2 | 1.2 | 8.8 |
| *IB-24* | 2.8 | 3.6 | 2.4 | 3.2 | 1.6 | 1.6 | 2.4 | 1.6 | 19.2 |
| *IB-25* | 1.2 | 0.8 | 0.8 | 0.4 | 0.4 | | 0.8 | 0.8 | 5.2 |
| *IB-26* | 1.2 | 0.8 | 0.8 | 0.4 | | | 0.8 | 0.8 | 4.8 |
| *IB-27* | 2.4 | 2 | 1.6 | 2 | 0.8 | 0.8 | 1.2 | 0.8 | 11.6 |
| *IB-28* | 1.6 | 0.8 | 0.8 | 1.6 | | 0.4 | 1.2 | 0.8 | 7.2 |
| *IB-29* | 1.6 | 0.8 | 0.8 | 1.2 | 0.4 | 0.4 | 1.6 | 0.8 | 7.6 |
| *IB-30* | 2.4 | 1.6 | 2.4 | 0.8 | 0.8 | 0.8 | 1.6 | 1.6 | 12 |
| *IB-31* | 1.2 | 0.4 | 0.4 | 0.8 | 0.4 | 0.8 | 0.8 | 0.8 | 5.6 |
| *IB-32* | 1.2 | 1.2 | 0.4 | 0.4 | 0.8 | 0.4 | 0.4 | 0.4 | 5.2 |
| *IB-33* | 2.4 | 2.4 | 2.4 | 2.4 | 1.6 | 2 | 2 | 2 | 17.2 |
| *IB-34* | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | | 0.8 | 0.8 | 5.6 |
| *IB-35* | 0.8 | 1.2 | 0.8 | 1.2 | 0.8 | 0.4 | 0.8 | 0.8 | 6.8 |
| *IB-36* | 2.4 | 2 | 1.6 | 1.6 | 0.8 | 0.8 | 1.2 | 1.2 | 11.6 |
| *IB-37* | 4 | 3.2 | 2.4 | 2.4 | 1.2 | 0.8 | 1.6 | 1.6 | 17.2 |
| *IB-38* | 1.6 | 1.6 | 1.6 | 0.8 | 0.8 | 0.4 | 1.2 | 1.2 | 9.2 |
| *IB-39* | 2.4 | 3.2 | 1.6 | 1.6 | 0.8 | 0.8 | 1.6 | 1.6 | 13.6 |
| *Total* | 74.8 | 70.4 | 56 | 50.4 | 32.8 | 29.6 | 52.4 | 48 | 414.4 |

## *Normalised Weights of Impacts*

# *Contractors*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 2.06 | 0.69 | 0.64 | 0.69 | 0.35 | 0.69 | 0.69 | 0.69 | 6.5 |
| *AG-2* | 0.69 | 0.69 | 0.69 | | 0.35 | 0.35 | | 0.69 | 3.46 |
| *AG-3* | 0.69 | 0.69 | | 0.35 | | | | | 1.73 |
| *AG-4* | | | | | | | | | |
| *Total* | 3.44 | 2.07 | 1.33 | 1.04 | 0.7 | 1.04 | 0.69 | 1.38 | 11.69 |
| *MM-1* | 1.03 | 1.03 | 1.03 | | 0.69 | 0.69 | 0.69 | 0.69 | 5.85 |
| *MM-2* | | | | | | | | | |
| *MM-3* | 0.35 | 0.35 | 0.35 | | | | | | 1.05 |
| *MM-4* | | | | | | | | | |
| *MM-5* | 1.38 | 1.38 | 1.03 | 0.35 | 0.69 | 0.69 | 0.69 | 0.69 | 6.9 |
| *MM-6* | | | | | | | | | |
| *Total* | 2.76 | 2.76 | 2.41 | 0.35 | 1.38 | 1.38 | 1.38 | 1.38 | 13.8 |
| *SC-1* | 1.38 | 1.38 | 0.69 | 0.69 | 0.69 | 0.69 | 0.69 | 0.35 | 6.56 |
| *SC-2* | 2.06 | 1.38 | 1.38 | 0.35 | 0.35 | 0.35 | 0.69 | 0.69 | 7.25 |
| *SC-3* | | | | | | | | | |
| *SC-4* | 0.69 | 0.35 | | | | | | 0.35 | 1.39 |
| *Total* | 4.13 | 3.11 | 2.07 | 1.04 | 1.04 | 1.04 | 1.38 | 1.39 | 15.2 |
| *MD-1* | 1.03 | 2.06 | 1.03 | 0.69 | 0.69 | 0.69 | 1.03 | 1.38 | 8.6 |
| *MD-2* | 0.35 | 1.38 | 0.69 | | | | 0.69 | 0.69 | 3.8 |
| *MD-Man* | 2.76 | 1.72 | 1.38 | 1.03 | 0.69 | 0.69 | 1.03 | 1.38 | 10.68 |
| *MD-E* | | | 0.35 | | | 0.35 | | | 0.7 |
| *MD-M* | 0.69 | 0.69 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.69 | 3.82 |
| *MD-P* | | | | | | | | | |
| *MD-T* | | | | | | | | | |
| *MD-else* | | | | | | | | | |
| *Total* | 4.83 | 5.85 | 3.8 | 2.07 | 1.73 | 2.08 | 3.1 | 4.14 | 27.6 |
| *CA-1* | 0.69 | 0.69 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.69 | 3.82 |
| *CA-2* | 6.55 | 5.8 | 4.14 | 1.38 | 1.38 | 2.06 | 4.14 | 5.52 | 30.97 |
| *CA-3* | 2.41 | 1.38 | 0.69 | 0.35 | 0.35 | 0.35 | 0.69 | 1.72 | 7.94 |
| *CA-4* | 3.8 | 9 | 1.72 | 0.69 | 1.38 | 1.38 | 1.38 | 3.45 | 22.8 |
| *CA-5* | 2.76 | 2.76 | 1.72 | 1.38 | 2.06 | 1.38 | 2.06 | 2.41 | 16.53 |
| *CA-6* | 1.38 | 1.72 | 1.03 | | 0.35 | | 1.03 | 1.38 | 6.89 |
| *CA-7* | 1.03 | 0.69 | 1.03 | | 0.69 | 0.69 | 0.69 | 0.69 | 5.51 |
| *CA-8* | 2.76 | 2.76 | 1.03 | 0.69 | 1.03 | 1.03 | 1.72 | 2.06 | 13.08 |
| *CA-9* | 1.72 | 2.06 | 1.38 | 0.35 | 0.69 | 0.69 | 1.38 | 1.38 | 9.65 |
| *CA-10* | 4.1 | 3.45 | 3.45 | 1.38 | 1.03 | 1.03 | 2.41 | 2.76 | 19.61 |
| *CA-11* | 4.1 | 3.8 | 2.76 | 0.35 | 0.69 | 0.69 | 2.41 | 3.45 | 18.25 |
| *CA-12* | 4.1 | 4.1 | 2.76 | 0.35 | 0.69 | 0.69 | 1.72 | 2.76 | 17.17 |
| *CA-13* | 5.9 | 4.8 | 3.8 | 1.72 | 1.72 | 1.72 | 3.45 | 3.8 | 26.91 |
| *CA-14* | 0.69 | 0.69 | | 0.69 | | 0.35 | 0.35 | 1.03 | 3.8 |
| *CA-15* | 1.72 | 1.72 | 1.03 | 0.69 | 1.03 | 1.03 | 1.38 | 1.38 | 9.98 |
| *CA-16* | 1.38 | 2.41 | 1.38 | 0.69 | 0.69 | 0.69 | 1.72 | 1.72 | 10.68 |
| *CA-17* | 1.72 | 2.06 | 1.38 | 1.72 | 1.03 | 1.03 | 2.06 | 2.06 | 13.06 |
| *CA-18* | 2.76 | 2.06 | 2.06 | 1.38 | 1.03 | 1.03 | 2.41 | 2.41 | 15.14 |
| *CA-19* | 1.03 | 1.03 | 1.03 | 0.69 | 0.35 | | 0.69 | 0.69 | 5.51 |
| *CA-20* | 0.69 | 0.69 | 0.69 | 0.35 | | | 0.35 | 0.69 | 3.46 |
| *Total* | 105.7 | 53.7 | 33.43 | 15.2 | 16.54 | 16.19 | 32.39 | 42.05 | 315.2 |

## *Normalised Weights of Impacts*

# *Contractors*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 1.03 | 1.03 | 1.38 | 10.34 |
| *IB-2* | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 2.8 |
| *IB-3* | 0.69 | 0.69 | | | | | | | 1.38 |
| *IB-4* | | | | | | | | | |
| *IB-5* | 0.69 | 0.69 | 0.69 | 0.69 | 0.35 | 0.69 | 0.69 | 0.69 | 5.18 |
| *IB-6* | 3.1 | 3.1 | 2.06 | 2.06 | 1.03 | 1.03 | 2.06 | 2.41 | 16.85 |
| *IB-7* | 2.06 | 1.72 | 1.38 | 1.38 | 0.69 | 0.69 | 1.38 | 1.72 | 11.02 |
| *IB-8* | 0.69 | 0.69 | 0.69 | 0.69 | | | 0.35 | 0.35 | 3.46 |
| *IB-9* | 3.45 | 2.76 | 2.06 | 1.38 | 0.69 | 1.03 | 2.06 | 2.06 | 15.49 |
| *IB-10* | 1.03 | 1.03 | 0.69 | 0.35 | 0.35 | 0.35 | 0.69 | 0.69 | 5.18 |
| *IB-11* | 3.45 | 4.4 | 2.76 | 1.38 | 1.03 | 1.38 | 2.06 | 3.45 | 19.91 |
| *IB-12* | 1.72 | 2.41 | | | | | 0.69 | 1.72 | 6.54 |
| *IB-13* | 6.9 | 5.52 | 3.45 | 1.03 | 1.38 | 2.06 | 3.45 | 3.45 | 27.24 |
| *IB-14* | 1.03 | 0.69 | 1.03 | 0.35 | 0.69 | 0.69 | 1.03 | 1.03 | 6.54 |
| *IB-15* | 4.8 | 3.8 | 2.41 | 1.03 | 1.38 | 1.03 | 2.06 | 2.41 | 18.92 |
| *IB-16* | 3.45 | 3.45 | 2.76 | 1.03 | 1.03 | 1.03 | 2.06 | 2.41 | 17.22 |
| *IB-17* | | | | | | | | | |
| *IB-18* | 1.03 | 2.06 | 0.69 | 0.35 | 0.35 | | 1.03 | 1.03 | 6.54 |
| *IB-19* | 0.35 | 0.35 | 0.35 | | | | 0.35 | 0.35 | 1.75 |
| *IB-20* | 0.69 | 0.69 | 0.35 | 0.35 | 0.35 | 0.69 | 0.69 | 0.69 | 4.5 |
| *IB-21* | 0.69 | 0.69 | 0.69 | 0.35 | | | 0.35 | 0.69 | 3.46 |
| *IB-22* | 2.06 | 1.72 | 1.38 | 1.38 | 0.69 | 0.69 | 1.03 | 1.03 | 9.98 |
| *IB-23* | 2.41 | 2.06 | 2.06 | 1.38 | 1.03 | 1.03 | 1.03 | 1.72 | 12.72 |
| *IB-24* | 2.41 | 2.76 | 1.38 | 1.38 | 1.03 | 1.03 | 1.72 | 1.38 | 13.09 |
| *IB-25* | 3.1 | 2.76 | 1.72 | 1.03 | 1.03 | 1.38 | 2.06 | 2.06 | 15.14 |
| *IB-26* | 3.45 | 3.1 | 1.72 | 0.69 | 0.69 | 0.69 | 2.41 | 2.76 | 15.51 |
| *IB-27* | 0.69 | 0.69 | 0.69 | 0.35 | 0.35 | 0.35 | 0.69 | 0.69 | 4.5 |
| *IB-28* | 0.69 | 0.69 | 0.69 | 0.35 | 0.35 | 0.35 | 1.03 | 1.03 | 5.18 |
| *IB-29* | 0.35 | 0.35 | 0.69 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 3.14 |
| *IB-30* | | | | | | | | | |
| *IB-31* | | | | | | | | | |
| *IB-32* | 2.06 | 2.41 | 1.38 | 0.69 | 1.03 | 1.03 | 1.38 | 1.72 | 11.7 |
| *IB-33* | | | | | | | | | |
| *IB-34* | 0.35 | 0.35 | 0.35 | | | 0.35 | 0.35 | 0.35 | 2.1 |
| *IB-35* | 1.38 | 1.38 | 1.03 | 0.69 | 0.69 | 1.38 | 1.38 | 1.38 | 9.31 |
| *IB-36* | 2.41 | 2.06 | 1.03 | 1.38 | 0.35 | 0.35 | 1.38 | 1.38 | 10.34 |
| *IB-37* | 4.8 | 4.8 | 2.41 | 2.76 | 1.38 | 2.06 | 2.76 | 2.76 | 23.73 |
| *IB-38* | 2.06 | 2.06 | 1.38 | 1.38 | 1.38 | 0.69 | 1.38 | 1.38 | 11.71 |
| *IB-39* | 3.45 | 4.4 | 1.38 | 0.69 | 0.69 | 0.69 | 2.06 | 2.06 | 15.42 |
| *Total* | 69 | 68 | 43 | 29 | 22 | 24 | 43 | 49 | 347 |

## *Normalised Weights of Impacts*

# *Consultants*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.52 | 1.1 | 0.6 | 0.9 | 0.9 | 1.1 | 0.6 | 0.6 | 7.32 |
| *AG-2* | | | | | | | | | |
| *AG-3* | 0.4 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 0.4 | 2.2 |
| *AG-4* | 0.4 | 0.4 | | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 | 2 |
| *Total* | 2.32 | 1.7 | 0.8 | 1.3 | 1.3 | 1.7 | 1.2 | 1.2 | 11.52 |
| *MM-1* | 0.6 | 0.4 | 0.4 | 0.2 | 0.2 | 0.2 | 0.4 | 0.4 | 2.8 |
| *MM-2* | | | | | | | | | |
| *MM-3* | | | | | | | | | |
| *MM-4* | | | | | | | | | |
| *MM-5* | 1.3 | 1.1 | 0.9 | 0.9 | 0.4 | 0.4 | 0.4 | 0.9 | 6.3 |
| *MM-6* | 1.1 | 1.1 | 0.4 | 0.9 | 0.4 | 0.2 | 0.2 | | 4.3 |
| *Total* | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 14 |
| *SC-1* | 0.4 | 0.4 | 0.9 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 2.7 |
| *SC-2* | 3.7 | 3.1 | 3.1 | 1.74 | 1.74 | 1.74 | 1.52 | 1.52 | 18.16 |
| *SC-3* | | | | | | | | | |
| *SC-4* | 0.4 | 0.2 | 0.2 | 0.2 | | | 0.2 | 0.2 | 1.4 |
| *Total* | 4.5 | 3.7 | 4.2 | 2.14 | 1.94 | 1.94 | 1.92 | 1.92 | 22.26 |
| *MD-1* | 0.6 | 1.1 | 0.9 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 5.6 |
| *MD-2* | 0.4 | 0.9 | 0.4 | 0.4 | 0.4 | 0.4 | 0.6 | 0.6 | 4.1 |
| *MD-Man* | 3.4 | 2.4 | 2.6 | 2.2 | 1.3 | 1.1 | 2.4 | 2.6 | 18 |
| *MD-E* | 1.74 | 1.3 | 1.52 | 1.1 | 0.6 | 0.6 | 1.3 | 1.3 | 9.46 |
| *MD-M* | 1.95 | 1.52 | 1.74 | 1.1 | 0.9 | 0.6 | 1.74 | 1.74 | 11.29 |
| *MD-P* | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.2 | 0.4 | 0.4 | 3 |
| *MD-T* | | | | | | | | | |
| *MD-else* | | | | | | | | | |
| *Total* | 8.49 | 7.62 | 7.56 | 5.8 | 4.2 | 3.5 | 7.04 | 7.24 | 51.45 |
| *CA-1* | 2.6 | 1.74 | 1.52 | 2.2 | 0.9 | 1.1 | 1.95 | 2.2 | 14.21 |
| *CA-2* | 6.1 | 6.52 | 4.6 | 2.4 | 2.6 | 1.74 | 3.3 | 3.9 | 31.16 |
| *CA-3* | 0.6 | 0.2 | 0.4 | 0.2 | 0.2 | 0.2 | 0.4 | 0.2 | 2.4 |
| *CA-4* | 0.9 | 0.6 | 0.9 | 0.9 | 0.6 | 0.6 | 1.1 | 1.1 | 6.7 |
| *CA-5* | 1.74 | 1.3 | 1.3 | 1.1 | 1.1 | 1.3 | 1.1 | 1.1 | 10.04 |
| *CA-6* | 1.52 | 1.95 | 2.4 | 1.3 | 1.1 | 1.3 | 1.74 | 1.74 | 13.05 |
| *CA-7* | 0.6 | 0.4 | | 0.2 | 0.2 | 0.2 | | | 1.6 |
| *CA-8* | 3.4 | 2.4 | 2.6 | 1.74 | 1.74 | 2.2 | 2.2 | 2.2 | 18.48 |
| *CA-9* | 0.4 | 0.9 | 0.4 | 0.4 | 0.2 | 0.2 | 0.4 | 0.4 | 3.3 |
| *CA-10* | 2.8 | 2.6 | 2.4 | 2.6 | 1.74 | 1.74 | 1.74 | 1.74 | 17.36 |
| *CA-11* | 2.6 | 2.4 | 1.95 | 1.1 | 0.9 | 0.9 | 1.3 | 1.52 | 12.67 |
| *CA-12* | 2.8 | 2.4 | 2.6 | 1.74 | 1.3 | 1.52 | 1.74 | 1.3 | 15.4 |
| *CA-13* | 0.9 | 0.9 | 0.9 | 1.1 | 0.6 | 0.9 | 0.6 | 1.1 | 7 |
| *CA-14* | 1.3 | 1.1 | 0.9 | 1.1 | 0.9 | 0.6 | 1.1 | 1.3 | 8.3 |
| *CA-15* | 2.8 | 2.6 | 1.52 | 1.1 | 1.1 | 0.9 | 1.74 | 1.95 | 13.71 |
| *CA-16* | 2.4 | 1.95 | 1.3 | 1.3 | 0.9 | 1.1 | 0.9 | 1.52 | 11.37 |
| *CA-17* | 0.6 | 1.3 | 1.1 | 1.3 | 0.6 | 0.6 | 1.1 | 1.1 | 7.7 |
| *CA-18* | 2.8 | 3.1 | 2.8 | 3.7 | 1.74 | 2.6 | 2.6 | 2.6 | 21.94 |
| *CA-19* | 1.3 | 1.1 | 0.9 | 0.9 | 0.4 | 0.2 | 0.6 | 0.9 | 6.3 |
| *CA-20* | 1.95 | 1.52 | 1.3 | 0.9 | 0.9 | 0.9 | 1.3 | 1.1 | 9.87 |
| *Total* | 40.11 | 36.98 | 31.79 | 27.28 | 19.72 | 20.8 | 26.91 | 28.97 | 232.56 |

## *Normalised Weights of Impacts*

# *Consultants*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 4.5 | 3.9 | 4.2 | 3.9 | 2.6 | 3 | 3.5 | 3.3 | 28.9 |
| *IB-2* | 2.2 | 2.4 | 2.2 | 2.6 | 1.3 | 2.2 | 2.6 | 2.2 | 17.7 |
| *IB-3* | 2.4 | 2.8 | 2.8 | 3.7 | 1.74 | 2.6 | 3.3 | 2.8 | 22.14 |
| *IB-4* | 0.9 | 0.9 | 0.9 | 1.1 | 0.9 | 0.9 | 0.9 | 0.9 | 7.4 |
| *IB-5* | 4.8 | 4.8 | 4.8 | 5.2 | 2.8 | 3.7 | 4.8 | 4 | 34.9 |
| *IB-6* | 1.74 | 1.3 | 1.1 | 0.9 | 0.9 | 1.1 | 1.3 | 1.3 | 9.64 |
| *IB-7* | 1.52 | 0.9 | 1.1 | 1.52 | 1.1 | 0.9 | 0.9 | 0.9 | 8.84 |
| *IB-8* | 6.3 | 5.2 | 4.5 | 5.2 | 3.3 | 3 | 4.8 | 4.8 | 37.1 |
| *IB-9* | 0.9 | 0.6 | 0.6 | 0.9 | 0.6 | 0.6 | 0.6 | 1.1 | 5.9 |
| *IB-10* | 3.7 | 4.2 | 3.1 | 3.7 | 2.6 | 2.2 | 2.8 | 2.6 | 24.9 |
| *IB-11* | 4.5 | 4.8 | 2.6 | 2.6 | 1.95 | 1.74 | 3.1 | 3.4 | 24.69 |
| *IB-12* | 0.6 | 0.6 | 0.6 | 0.4 | 0.4 | 0.4 | 0.9 | 0.9 | 4.8 |
| *IB-13* | 2.6 | 2.2 | 2.4 | 1.1 | 1.1 | 1.1 | 1.74 | 1.52 | 13.76 |
| *IB-14* | 2.6 | 1.74 | 2.2 | 1.52 | 1.3 | 1.1 | 1.74 | 1.74 | 13.94 |
| *IB-15* | 2.6 | 1.52 | 1.95 | 1.3 | 1.3 | 0.9 | 1.3 | 1.3 | 12.17 |
| *IB-16* | 2.4 | 1.74 | 1.95 | 1.3 | 1.3 | 0.6 | 1.52 | 1.3 | 12.11 |
| *IB-17* | 1.95 | 1.52 | 1.74 | 0.9 | 1.1 | 0.9 | 1.1 | 1.3 | 10.51 |
| *IB-18* | 1.95 | 1.74 | 1.74 | 0.9 | 0.9 | 0.4 | 1.1 | 1.1 | 9.83 |
| *IB-19* | 1.74 | 1.74 | 1.74 | 0.9 | 0.9 | 0.9 | 1.3 | 1.3 | 10.52 |
| *IB-20* | 2.2 | 2.2 | 1.74 | 0.6 | 0.9 | 1.1 | 1.3 | 1.3 | 11.34 |
| *IB-21* | 1.1 | 1.74 | 1.3 | 1.74 | 1.1 | 0.9 | 1.3 | 1.3 | 10.48 |
| *IB-22* | 2.2 | 2.4 | 1.74 | 1.95 | 1.52 | 1.74 | 1.74 | 1.52 | 14.81 |
| *IB-23* | 0.6 | 0.9 | 0.4 | 0.9 | 0.4 | 0.4 | 0.4 | 0.4 | 4.4 |
| *IB-24* | 2.2 | 2.4 | 1.95 | 2.4 | 1.74 | 1.95 | 1.3 | 1.3 | 15.24 |
| *IB-25* | 1.95 | 1.95 | 1.74 | 0.9 | 1.1 | 0.9 | 1.3 | 1.3 | 11.14 |
| *IB-26* | 1.1 | 0.9 | 0.9 | 0.6 | 0.9 | 0.9 | 1.1 | 0.9 | 7.3 |
| *IB-27* | 3.4 | 2.2 | 2.6 | 1.74 | 1.52 | 1.52 | 2.2 | 2.2 | 17.38 |
| *IB-28* | 3.4 | 2.2 | 2.6 | 2.4 | 1.74 | 1.3 | 2.2 | 2.2 | 18.04 |
| *IB-29* | 2.4 | 1.74 | 1.74 | 1.95 | 1.52 | 1.52 | 1.74 | 1.74 | 14.35 |
| *IB-30* | 4 | 2.4 | 3.1 | 2.2 | 1.52 | 1.52 | 2.6 | 2.6 | 19.94 |
| *IB-31* | 3.3 | 2.2 | 2.2 | 2.2 | 1.3 | 1.52 | 2.2 | 2.2 | 17.12 |
| *IB-32* | 1.74 | 1.74 | 1.95 | 0.9 | 1.3 | 1.1 | 1.3 | 1.3 | 11.33 |
| *IB-33* | 2.4 | 1.95 | 1.95 | 1.74 | 1.3 | 1.3 | 1.3 | 1.3 | 13.24 |
| *IB-34* | 0.9 | 0.9 | 0.9 | 0.6 | 0.6 | 0.6 | 0.9 | 0.9 | 6.3 |
| *IB-35* | 0.9 | 0.9 | 0.4 | 0.6 | 0.4 | 0.4 | 1.1 | 1.1 | 5.8 |
| *IB-36* | 3.1 | 2.2 | 1.52 | 1.74 | 1.74 | 1.3 | 1.95 | 1.95 | 15.5 |
| *IB-37* | 2.6 | 1.74 | 0.9 | 1.3 | 0.6 | 0.9 | 1.3 | 1.52 | 10.86 |
| *IB-38* | 0.9 | 0.4 | 0.2 | 0.6 | 0.2 | 0.2 | 0.6 | 0.4 | 3.5 |
| *IB-39* | 1.3 | 2.2 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 10.1 |
| *Total* | 91.59 | 79.86 | 73.15 | 67.8 | 50.59 | 50.41 | 68.23 | 66.29 | 547.92 |

## *Normalised Weights of Impacts*

# *Government*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.3 | 0.53 | 0.53 | 0.53 | 0.26 | 0.26 | 0.53 | 0.53 | 4.47 |
| *AG-2* | 0.53 | 0.53 | 0.53 | | 0.26 | 0.26 | | 0.53 | 2.64 |
| *AG-3* | | | | 0.26 | | | | | 0.26 |
| *AG-4* | 0.53 | 0.53 | | 0.26 | 0.26 | 0.53 | 0.26 | 0.26 | 2.63 |
| *Total* | 2.36 | 1.59 | 1.06 | 1.05 | 0.78 | 1.05 | 0.79 | 1.32 | 10 |
| *MM-1* | 1.58 | 1.3 | 1.3 | 0.79 | 0.79 | 0.26 | 1 | 0.53 | 7.55 |
| *MM-2* | | | | | | | | | |
| *MM-3* | 0.26 | 0.26 | 0.26 | | | | | | 0.78 |
| *MM-4* | | | | | | | | | |
| *MM-5* | 1.3 | 1.3 | 1 | 0.53 | 0.79 | 0.79 | 0.79 | 1.58 | 8.08 |
| *MM-6* | 0.53 | 0.53 | | | | | | | 1.06 |
| *Total* | 3.67 | 3.39 | 2.56 | 1.32 | 1.58 | 1.05 | 1.79 | 2.11 | 17.47 |
| *SC-1* | 0.79 | 0.79 | 0.53 | 0.53 | 0.26 | 0.26 | 0.26 | 0.26 | 3.68 |
| *SC-2* | 2.9 | 3.2 | 2.4 | 1 | 1 | 1 | 1.3 | 1.58 | 14.38 |
| *SC-3* | | 0.26 | 0.53 | | | | | | 0.79 |
| *SC-4* | 1 | 0.79 | 1.3 | 0.53 | 0.53 | 1 | 0.79 | 0.79 | 6.73 |
| *Total* | 4.69 | 5.04 | 4.76 | 2.06 | 1.79 | 2.26 | 2.35 | 2.63 | 25.58 |
| *MD-1* | 1 | 1.8 | 1 | 0.53 | 0.53 | 0.53 | 1 | 1 | 7.39 |
| *MD-2* | 1 | 1.58 | 0.79 | 0.53 | 0.53 | 0.53 | 0.79 | 1 | 6.75 |
| *MD-Man* | 2.4 | 1.58 | 1.58 | 1.3 | 0.79 | 0.79 | 7 | 8 | 23.44 |
| *MD-E* | 1.3 | 1 | 1 | 1 | 0.53 | 0.53 | 1 | 1.3 | 7.66 |
| *MD-M* | 8 | 1.58 | 1.58 | 1 | 0.79 | 0.79 | 1.58 | 8 | 23.32 |
| *MD-P* | 0.53 | 0.53 | 0.53 | 0.53 | 0.53 | 0.26 | 0.53 | 0.53 | 3.97 |
| *MD-T* | | | | | | | | | |
| *MD-else* | | | | | | | | | |
| *Total* | 14.23 | 8.07 | 6.48 | 4.89 | 3.7 | 3.43 | 11.9 | 19.83 | 72.53 |
| *CA-1* | 2.1 | 2.1 | 1.58 | 1 | 0.79 | 0.53 | 1.58 | 7 | 16.68 |
| *CA-2* | 6.6 | 7.6 | 4.7 | 2.1 | 2.6 | 1.8 | 3.9 | 5 | 34.3 |
| *CA-3* | 1.58 | 0.53 | 0.53 | | | | 0.53 | 0.53 | 3.7 |
| *CA-4* | 1 | 0.53 | 0.79 | 0.26 | 0.26 | 0.26 | 0.53 | 0.53 | 4.16 |
| *CA-5* | 1.58 | 1 | 1 | 0.79 | 0.79 | 1 | 0.79 | 0.79 | 7.74 |
| *CA-6* | 2.4 | 2.1 | 1.8 | 1.58 | 1 | 1.58 | 1.8 | 1.8 | 14.06 |
| *CA-7* | 0.53 | 0.79 | | 0.53 | 0.26 | 0.26 | | | 2.37 |
| *CA-8* | 3.7 | 2.6 | 2.6 | 1.3 | 1.3 | 1.3 | 2.4 | 2.1 | 17.3 |
| *CA-9* | 1 | 1.8 | 0.53 | 0.26 | 0.53 | 0.53 | 1 | 1 | 6.65 |
| *CA-10* | 2.9 | 2.9 | 2.6 | 1.58 | 1 | 1 | 1.58 | 1.8 | 15.36 |
| *CA-11* | 2.9 | 3.2 | 2.1 | 0.53 | 0.79 | 0.79 | 1.8 | 2.1 | 14.21 |
| *CA-12* | 2.9 | 3.7 | 2.1 | 0.79 | 1 | 1 | 1.58 | 2.4 | 15.47 |
| *CA-13* | 1.8 | 1.8 | 1.58 | 0.53 | 0.53 | 0.53 | 1.58 | 1.3 | 9.65 |
| *CA-14* | 0.53 | 0.79 | 0.79 | 0.53 | 0.26 | 0.26 | 0.26 | 0.53 | 3.95 |
| *CA-15* | 2.4 | 1.8 | 1 | 1 | 0.79 | 0.53 | 0.79 | 1 | 9.31 |
| *CA-16* | 2.6 | 2.4 | 1 | 1.58 | 0.79 | 0.79 | 0.53 | 1.58 | 11.27 |
| *CA-17* | 1 | 1 | 0.79 | 0.79 | 0.53 | 0.53 | 1.3 | 1.3 | 7.24 |
| *CA-18* | 2.6 | 2.4 | 1.58 | 1.3 | 0.79 | 0.79 | 1.3 | 1.8 | 12.56 |
| *CA-19* | 2.6 | 2.1 | 1.3 | 1.3 | 1 | 1 | 1.3 | 1.8 | 12.4 |
| *CA-20* | 1 | 1.3 | 0.79 | 0.53 | 0.53 | 0.53 | 1 | 1 | 6.68 |
| *Total* | 43.72 | 42.44 | 29.16 | 18.28 | 15.54 | 15.01 | 25.55 | 35.36 | 225.06 |

## *Normalised Weights of Impacts*

# *Government*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 2.4 | 2.1 | 1.8 | 2.1 | 1.3 | 2.1 | 2.1 | 2.4 | 16.3 |
| *IB-2* | 1.3 | 1.3 | 0.79 | 1.3 | 0.53 | 1 | 1.3 | 1 | 8.52 |
| *IB-3* | 1.3 | 1.8 | 1.3 | 1.8 | 0.79 | 1 | 1.58 | 1.58 | 11.15 |
| *IB-4* | 1.3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8.3 |
| *IB-5* | 2.9 | 3.2 | 3.4 | 2.6 | 1 | 1.58 | 2.1 | 2.1 | 18.88 |
| *IB-6* | 0.26 | 0.26 | 0.26 | 0.53 | | 0.26 | 0.26 | 0.26 | 2.09 |
| *IB-7* | 1.58 | 1.8 | 1.3 | 1 | 0.79 | 0.79 | 1 | 1 | 9.26 |
| *IB-8* | 4.2 | 3.9 | 3.2 | 2.6 | 1.58 | 1.58 | 2.9 | 2.6 | 22.56 |
| *IB-9* | 1 | 1 | 1 | 0.79 | 0.53 | 0.53 | 1 | 1 | 6.85 |
| *IB-10* | 3.2 | 3.4 | 2.6 | 2.4 | 1.8 | 1.58 | 2.9 | 2.9 | 20.78 |
| *IB-11* | 4.2 | 5 | 3.4 | 2.4 | 2.9 | 2.1 | 3.2 | 3.2 | 26.4 |
| *IB-12* | 1.58 | 1.8 | 1.3 | 1 | 0.79 | 1 | 1 | 1.3 | 9.77 |
| *IB-13* | 3.9 | 3.4 | 2.9 | 1 | 1.3 | 0.79 | 2.1 | 2.1 | 17.49 |
| *IB-14* | 2.4 | 1.8 | 1.8 | 1 | 0.79 | 0.79 | 1.58 | 1.58 | 11.74 |
| *IB-15* | 2.6 | 2.1 | 1.58 | 0.79 | 1 | 0.79 | 1.8 | 2.1 | 12.76 |
| *IB-16* | 2.6 | 2.1 | 1.58 | 0.53 | 0.53 | 0.53 | 1.3 | 1.8 | 10.97 |
| *IB-17* | 1.3 | 1 | 1 | 0.53 | 0.53 | 0.53 | 1 | 1 | 6.89 |
| *IB-18* | 2.1 | 2.1 | 1.58 | 0.53 | 0.26 | 0.53 | 1.3 | 1.3 | 9.7 |
| *IB-19* | 1 | 1 | 0.79 | 0.26 | 0.26 | 0.53 | 0.79 | 0.53 | 5.16 |
| *IB-20* | 2.9 | 2.1 | 1.58 | 1 | 0.53 | 1 | 1.8 | 1.8 | 12.71 |
| *IB-21* | | 0.26 | | | | | | | 0.26 |
| *IB-22* | 1.8 | 1.8 | 1 | 1.3 | 0.79 | 0.53 | 0.79 | 0.79 | 8.8 |
| *IB-23* | 2.4 | 2.4 | 2.1 | 1.58 | 1.58 | 1 | 1.58 | 1.58 | 14.22 |
| *IB-24* | 2.1 | 2.6 | 1 | 1.3 | 0.79 | 0.79 | 1 | 1 | 10.58 |
| *IB-25* | 1.8 | 1.58 | 1 | 0.53 | 0.53 | 0.53 | 1 | 1 | 7.97 |
| *IB-26* | 2.1 | 1.8 | 1.58 | 1 | 0.79 | 0.79 | 1.58 | 1.58 | 11.22 |
| *IB-27* | 3.2 | 2.4 | 2.4 | 2.1 | 1 | 1.3 | 2.1 | 2.4 | 16.9 |
| *IB-28* | 2.6 | 2.1 | 1.58 | 1.58 | 0.79 | 1 | 1.58 | 1.58 | 12.81 |
| *IB-29* | 2.1 | 1.3 | 1.3 | 1.3 | 1 | 1 | 1.8 | 1.58 | 11.38 |
| *IB-30* | 3.9 | 2.6 | 3.2 | 1.8 | 1.58 | 1.58 | 2.6 | 2.6 | 19.86 |
| *IB-31* | 2.4 | 1.8 | 1.3 | 1 | 1 | 1.3 | 2.1 | 1.8 | 12.7 |
| *IB-32* | 2.1 | 2.1 | 1 | 1 | 1 | 1 | 1 | 1.3 | 10.5 |
| *IB-33* | 2.4 | 2.1 | 2.1 | 2.1 | 1.58 | 1.58 | 1.8 | 1.8 | 15.46 |
| *IB-34* | 1.58 | 1.58 | 1.58 | 1.58 | 1.3 | 0.79 | 1.58 | 1.58 | 11.57 |
| *IB-35* | 1.8 | 1.8 | 1 | 1.3 | 1 | 1 | 1.8 | 1.58 | 11.28 |
| *IB-36* | 1.58 | 1.58 | 1 | 1.3 | 0.53 | 0.79 | 1 | 1.3 | 9.08 |
| *IB-37* | 2.4 | 2.1 | 1 | 1 | 0.53 | 0.53 | 1.3 | 1.3 | 10.16 |
| *IB-38* | 1.58 | 1.58 | 1 | 0.53 | 0.53 | 0.26 | 1 | 0.79 | 7.27 |
| *IB-39* | 3.2 | 3.9 | 2.1 | 1.58 | 1.3 | 1.58 | 2.1 | 2.1 | 17.86 |
| *Total* | 85.1 | 79.5 | 61.4 | 49.04 | 35.83 | 37.36 | 59.72 | 60.21 | 468.16 |

## *Normalised Weights of Impacts*

# *Private Sector*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.77 | 1.45 | 1.3 | 1.6 | 1.1 | 1.45 | 0.97 | 1.1 | 10.74 |
| *AG-2* | | | | | | | | | |
| *AG-3* | 0.48 | 0.32 | 0.16 | 0.16 | 0.16 | 0.16 | 0.32 | 0.32 | 2.08 |
| *AG-4* | | | | | | | | | |
| *Total* | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 12 |
| *MM-1* | 0.32 | 0.32 | 0.32 | | 0.32 | 0.32 | 0.32 | 0.32 | 2.24 |
| *MM-2* | | | | | | | | | |
| *MM-3* | | | | | | | | | |
| *MM-4* | | 0.16 | | | | 0.16 | | 0.16 | 0.48 |
| *MM-5* | 0.97 | 1.1 | 0.8 | 0.48 | 0.65 | 0.32 | 0.32 | 0.32 | 4.96 |
| *MM-6* | 0.8 | 0.8 | 0.65 | 0.8 | 0.65 | 0.16 | 0.32 | 0.32 | 4.5 |
| *Total* | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 12 |
| *SC-1* | 0.48 | 0.48 | 0.65 | 0.32 | 0.32 | 0.32 | 0.32 | 0.16 | 3.05 |
| *SC-2* | 2.9 | 2.6 | 2.1 | 1.45 | 1.1 | 1.3 | 1.45 | 1.45 | 14.35 |
| *SC-3* | | | | | | | | | |
| *SC-4* | 0.48 | 0.32 | 0.32 | | 0.16 | 0.16 | 0.32 | 0.32 | 2.08 |
| *Total* | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 20 |
| *MD-1* | 0.65 | 1.1 | 0.8 | 0.65 | 0.65 | 0.65 | 0.48 | 0.65 | 5.63 |
| *MD-2* | | 0.65 | 0.48 | 0.32 | 0.32 | 0.32 | 0.32 | 0.16 | 2.57 |
| *MD-Man* | 2.6 | 1.9 | 1.9 | 1.45 | 0.8 | 0.97 | 1.45 | 1.6 | 12.67 |
| *MD-E* | 0.97 | 0.48 | 0.97 | 0.32 | 0.32 | 0.48 | 0.65 | 0.65 | 4.84 |
| *MD-M* | 0.8 | 0.65 | 0.65 | 0.32 | 0.32 | 0.32 | 0.32 | 0.48 | 3.86 |
| *MD-P* | | 0.16 | | | | | | | 0.16 |
| *MD-T* | | 0.16 | | | | | | | 0.16 |
| *MD-else* | | | | | | | | | |
| *Total* | 5 | 5 | 5 | 3 | 2 | 3 | 3 | 4 | 30 |
| *CA-1* | 2.1 | 1.1 | 0.97 | 1.3 | 0.32 | 0.97 | 1.3 | 1.45 | 9.51 |
| *CA-2* | 4.7 | 4.5 | 3.4 | 1.77 | 1.1 | 1.9 | 2.9 | 3.4 | 23.67 |
| *CA-3* | 1.3 | 0.97 | 0.8 | 0.32 | 0.32 | 0.48 | 0.65 | 0.97 | 5.81 |
| *CA-4* | 2.15 | 2.3 | 1.77 | 1.3 | 1.1 | 1.1 | 1.45 | 2.4 | 13.57 |
| *CA-5* | 1.9 | 1.77 | 1.3 | 1.1 | 1.3 | 1.3 | 1.6 | 1.6 | 11.87 |
| *CA-6* | 1.77 | 2.3 | 1.9 | 0.8 | 0.65 | 0.97 | 1.9 | 1.9 | 12.19 |
| *CA-7* | 0.65 | 0.32 | 0.32 | | 0.32 | 0.32 | 0.32 | 0.32 | 2.57 |
| *CA-8* | 3.1 | 2.6 | 1.9 | 1.45 | 1.3 | 1.77 | 1.9 | 2.3 | 16.32 |
| *CA-9* | 1.1 | 1.45 | 0.97 | 0.48 | 0.48 | 0.48 | 0.8 | 0.97 | 6.73 |
| *CA-10* | 3.6 | 2.9 | 2.9 | 2.3 | 1.6 | 1.45 | 1.9 | 2.1 | 18.75 |
| *CA-11* | 3.1 | 2.9 | 2.4 | 1.1 | 0.65 | 0.97 | 2.1 | 2.4 | 15.62 |
| *CA-12* | 2.9 | 2.6 | 2.6 | 1.3 | 0.97 | 1.1 | 1.45 | 1.45 | 14.37 |
| *CA-13* | 2.9 | 2.4 | 2.3 | 1.77 | 1.3 | 1.45 | 1.6 | 2.3 | 16.02 |
| *CA-14* | 1.3 | 1.1 | 0.65 | 0.97 | 0.48 | 0.65 | 0.97 | 1.1 | 7.22 |
| *CA-15* | 1.6 | 1.77 | 1.3 | 0.8 | 0.97 | 0.8 | 1.6 | 1.6 | 10.44 |
| *CA-16* | 1.3 | 1.77 | 1.6 | 0.97 | 0.97 | 1.1 | 1.45 | 1.45 | 10.61 |
| *CA-17* | 0.97 | 1.6 | 1.3 | 1.3 | 0.65 | 0.65 | 1.3 | 1.45 | 9.22 |
| *CA-18* | 2.9 | 3.1 | 2.9 | 3.2 | 1.9 | 2.6 | 3.1 | 2.6 | 22.3 |
| *CA-19* | 1.1 | 0.97 | 0.8 | 0.65 | 0.32 | 0.32 | 0.65 | 0.65 | 5.46 |
| *CA-20* | 1.3 | 0.8 | 0.8 | 0.48 | 0.32 | 0.48 | 0.65 | 0.65 | 5.48 |
| *Total* | 42 | 39 | 33 | 23 | 17 | 21 | 30 | 33 | 238 |

## *Normalised Weights of Impacts*

# *Private Sector*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 4.5 | 4 | 3.9 | 4.2 | 2.9 | 2.9 | 3.5 | 3.4 | 29.3 |
| *IB-2* | 1.77 | 1.77 | 1.45 | 1.9 | 0.97 | 1.3 | 1.77 | 1.3 | 12.23 |
| *IB-3* | 2.3 | 2.3 | 1.9 | 2.6 | 1.3 | 1.6 | 2.3 | 1.77 | 16.07 |
| *IB-4* | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 2.56 |
| *IB-5* | 4.2 | 4 | 3.5 | 4.4 | 2.6 | 3 | 3.9 | 3.5 | 29.1 |
| *IB-6* | 2.6 | 2.3 | 1.6 | 1.6 | 0.97 | 1.1 | 1.6 | 1.9 | 13.67 |
| *IB-7* | 1.6 | 1.1 | 1.1 | 1.45 | 0.8 | 0.65 | 0.97 | 1.1 | 8.77 |
| *IB-8* | 4 | 3.2 | 3 | 3.7 | 2.3 | 2.1 | 3.2 | 3.2 | 24.7 |
| *IB-9* | 2.1 | 1.45 | 1.1 | 1.1 | 0.48 | 0.8 | 1.3 | 1.45 | 9.78 |
| *IB-10* | 2.1 | 2.4 | 1.9 | 2.3 | 1.3 | 1.3 | 1.77 | 1.45 | 14.52 |
| *IB-11* | 3.6 | 4 | 2.3 | 1.6 | 0.97 | 1.3 | 2.1 | 2.9 | 18.77 |
| *IB-12* | 0.97 | 1.1 | 0.32 | 0.32 | 0.32 | 0.32 | 0.8 | 0.97 | 5.12 |
| *IB-13* | 3.7 | 2.6 | 2.3 | 0.97 | 0.97 | 1.3 | 2.1 | 2.1 | 16.04 |
| *IB-14* | 1.9 | 1.45 | 1.45 | 0.97 | 0.97 | 0.97 | 1.3 | 1.3 | 10.31 |
| *IB-15* | 3.7 | 2.4 | 2.3 | 1.3 | 1.3 | 1.1 | 1.45 | 1.6 | 15.15 |
| *IB-16* | 2.6 | 2.3 | 2.4 | 1.3 | 1.1 | 0.97 | 1.9 | 1.77 | 14.34 |
| *IB-17* | 0.8 | 0.48 | 0.65 | 0.32 | 0.48 | 0.32 | 0.32 | 0.32 | 3.69 |
| *IB-18* | 1.3 | 1.6 | 0.97 | 0.48 | 0.65 | 0.16 | 0.8 | 0.8 | 6.76 |
| *IB-19* | 0.97 | 1.1 | 1.1 | 0.48 | 0.48 | 0.48 | 0.65 | 0.8 | 6.06 |
| *IB-20* | 1.77 | 1.77 | 1.3 | 0.65 | 0.8 | 1.1 | 0.97 | 0.8 | 9.16 |
| *IB-21* | 0.97 | 1.45 | 1.3 | 1.3 | 0.8 | 0.65 | 0.97 | 1.3 | 8.74 |
| *IB-22* | 1.9 | 1.77 | 1.9 | 1.9 | 1.3 | 1.3 | 1.45 | 1.3 | 12.82 |
| *IB-23* | 0.8 | 0.8 | 0.65 | 0.8 | 0.16 | 0.32 | 0.32 | 0.65 | 4.5 |
| *IB-24* | 2.6 | 2.9 | 2.4 | 2.9 | 1.9 | 1.9 | 2.3 | 1.6 | 18.5 |
| *IB-25* | 2.3 | 2.3 | 1.77 | 1.1 | 1.1 | 1.1 | 1.77 | 1.6 | 13.04 |
| *IB-26* | 1.6 | 1.45 | 0.97 | 0.32 | 0.48 | 0.48 | 1.3 | 1.1 | 7.7 |
| *IB-27* | 1.9 | 1.3 | 1.3 | 0.97 | 0.8 | 0.8 | 1.1 | 0.97 | 9.14 |
| *IB-28* | 1.9 | 1.1 | 1.6 | 1.6 | 0.97 | 0.65 | 1.45 | 1.45 | 10.72 |
| *IB-29* | 1.3 | 0.97 | 0.97 | 1.3 | 0.8 | 0.8 | 0.97 | 0.8 | 7.91 |
| *IB-30* | 1.9 | 0.8 | 1.45 | 0.97 | 0.48 | 0.48 | 0.97 | 0.97 | 8.02 |
| *IB-31* | 1.6 | 0.65 | 0.97 | 1.1 | 0.48 | 0.65 | 0.8 | 0.8 | 7.05 |
| *IB-32* | 1.45 | 1.77 | 1.6 | 0.65 | 1.1 | 0.97 | 1.1 | 0.97 | 9.61 |
| *IB-33* | 1.3 | 0.97 | 0.97 | 0.97 | 0.65 | 0.65 | 0.65 | 0.65 | 6.81 |
| *IB-34* | 0.16 | 0.16 | 0.16 | | | 0.16 | 0.16 | 0.16 | 0.96 |
| *IB-35* | 0.65 | 0.65 | 0.65 | 0.48 | 0.32 | 0.65 | 0.65 | 0.65 | 4.7 |
| *IB-36* | 3.2 | 2.6 | 1.6 | 1.9 | 1.3 | 1.1 | 1.77 | 1.6 | 15.07 |
| *IB-37* | 4.2 | 3.4 | 1.9 | 2.6 | 1.3 | 1.6 | 2.1 | 2.3 | 19.4 |
| *IB-38* | 1.45 | 0.97 | 0.8 | 1.1 | 0.65 | 0.65 | 1.1 | 0.97 | 7.69 |
| *IB-39* | 1.6 | 2.4 | 0.8 | 0.8 | 0.65 | 0.65 | 1.3 | 1.45 | 9.65 |
| *Total* | 80 | 70 | 59 | 55 | 37 | 39 | 55 | 54 | 449 |

## *Normalised Weights of Impacts*

# *Less Than 5 Millions*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.8 | 1 | 1.3 | 1.6 | 0.8 | 1 | 0.8 | 1 | 9.3 |
| *AG-2* | | | | | | | | | |
| *AG-3* | 0.3 | | | | | | | | 0.3 |
| *AG-4* | | | | | | | | | |
| *Total* | 2.1 | 1 | 1.3 | 1.6 | 0.8 | 1 | 0.8 | 1 | 9.6 |
| *MM-1* | | | | | | | | | |
| *MM-2* | | | | | | | | | |
| *MM-3* | | | | | | | | | |
| *MM-4* | | 0.3 | | | | | | 0.3 | 0.6 |
| *MM-5* | 1 | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.8 | 5.3 |
| *MM-6* | 0.8 | 0.8 | 1 | 1 | 0.5 | 0.3 | 0.5 | 0.5 | 5.4 |
| *Total* | 1.8 | 2.1 | 1.5 | 1.5 | 1 | 0.8 | 1 | 1.6 | 11.3 |
| *SC-1* | 0.5 | 0.5 | 1 | 0.3 | 0.3 | | | | 2.6 |
| *SC-2* | 2.1 | 2.1 | 1.8 | 1.6 | 1 | 1.6 | 1.6 | 1 | 12.8 |
| *SC-3* | | 0.3 | 0.5 | | | | | | 0.8 |
| *SC-4* | | | 0.3 | | | | | | 0.3 |
| *Total* | 2.6 | 2.9 | 3.6 | 1.9 | 1.3 | 1.6 | 1.6 | 1 | 16.5 |
| *MD-1* | 0.8 | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 4.8 |
| *MD-2* | | | | | | | | | |
| *MD-Man* | 2.6 | 2.1 | 1.8 | 1.8 | 1 | 1 | 1.6 | 1.8 | 13.7 |
| *MD-E* | 0.5 | 0.5 | 0.5 | 0.5 | 0.3 | 0.3 | 0.5 | 0.5 | 3.6 |
| *MD-M* | 0.8 | 0.5 | 0.8 | 0.5 | | | 0.5 | 0.5 | 3.6 |
| *MD-P* | | | | | | | | | |
| *MD-T* | | | | | | | | | |
| *MD-else* | | | | | | | | | |
| *Total* | 4.7 | 4.1 | 3.6 | 3.3 | 1.8 | 1.8 | 3.1 | 3.3 | 25.7 |
| *CA-1* | 1.3 | 1 | 1 | 0.8 | 0.5 | 0.5 | 1 | 1 | 7.1 |
| *CA-2* | 3.7 | 3.9 | 2.6 | 2.4 | 1.3 | 1.3 | 2.1 | 2.6 | 19.9 |
| *CA-3* | 1 | 0.8 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 3.8 |
| *CA-4* | 1.8 | 1.3 | 1.8 | 1.6 | 0.8 | 0.8 | 0.8 | 0.8 | 9.7 |
| *CA-5* | 1 | 1.3 | 0.8 | 1.6 | 1 | 1.3 | 1.3 | 1.3 | 9.6 |
| *CA-6* | 1.6 | 1.6 | 1.3 | 1 | 0.8 | 0.5 | 1.3 | 0.8 | 8.9 |
| *CA-7* | 0.3 | | | | | | | | 0.3 |
| *CA-8* | 2.1 | 1.8 | 1 | 1.3 | 1 | 1 | 1.3 | 1.6 | 11.1 |
| *CA-9* | 0.5 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 2.8 |
| *CA-10* | 1.8 | 1.6 | 1.6 | 1.3 | 0.5 | 0.5 | 0.8 | 0.5 | 8.6 |
| *CA-11* | 1.3 | 1.6 | 1.6 | 0.8 | 0.3 | 0.5 | 1 | 0.5 | 7.6 |
| *CA-12* | 0.8 | 1 | 0.3 | 0.5 | 0.3 | 0.5 | 0.5 | 0.8 | 4.7 |
| *CA-13* | 1.3 | 1.6 | 1 | 1 | 0.5 | 0.8 | 0.5 | 1 | 7.7 |
| *CA-14* | 0.5 | 1 | 0.8 | 0.5 | 0.3 | 0.3 | 0.5 | 0.3 | 4.2 |
| *CA-15* | 1.6 | 2.1 | 1 | 1 | 1 | 1 | 1.6 | 1.6 | 10.9 |
| *CA-16* | 1.3 | 1.3 | 1.6 | 1 | 0.8 | 1.3 | 1 | 1 | 9.3 |
| *CA-17* | 0.8 | 1.6 | 0.8 | 0.8 | 0.5 | 0.5 | 0.8 | 0.8 | 6.6 |
| *CA-18* | 3.2 | 3.7 | 3.2 | 3.7 | 2.4 | 2.9 | 3.2 | 2.6 | 24.9 |
| *CA-19* | 1.3 | 0.8 | 0.8 | 0.8 | 0.3 | 0.3 | 0.5 | 0.5 | 5.3 |
| *CA-20* | 0.5 | 0.5 | 0.5 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 3.2 |
| *Total* | 27.7 | 29 | 22.5 | 21.2 | 13.2 | 14.9 | 19.1 | 18.6 | 166.2 |

## *Normalised Weights of Impacts*

# *Less Than 5 Millions*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 3.7 | 3.4 | 3.2 | 3.7 | 2.9 | 2.9 | 3.2 | 3.2 | 26.2 |
| *IB-2* | 1.6 | 1.3 | 0.8 | 1.6 | 0.8 | 1 | 1.6 | 1 | 9.7 |
| *IB-3* | 2.4 | 2.4 | 1.8 | 2.6 | 1.6 | 1.6 | 2.6 | 2.1 | 17.1 |
| *IB-4* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 4 |
| *IB-5* | 5 | 5.3 | 4.2 | 4.7 | 3.2 | 3.7 | 4.5 | 3.9 | 34.5 |
| *IB-6* | 2.1 | 1.8 | 1 | 1.3 | 1 | 1 | 0.8 | 0.8 | 9.8 |
| *IB-7* | 1.3 | 1 | 0.5 | 1 | 0.5 | 0.3 | 0.3 | 0.5 | 5.4 |
| *IB-8* | 3.7 | 3.7 | 2.9 | 3.4 | 1.8 | 1.6 | 2.6 | 2.6 | 22.3 |
| *IB-9* | 1 | 0.5 | 0.3 | 0.5 | | | 0.3 | 0.5 | 3.1 |
| *IB-10* | 2.1 | 2.6 | 2.1 | 2.4 | 1.8 | 1.6 | 2.1 | 1.6 | 16.3 |
| *IB-11* | 3.7 | 3.7 | 2.1 | 1.6 | 1 | 1 | 1.8 | 2.1 | 17 |
| *IB-12* | 0.3 | 0.3 | 0.5 | 0.5 | 0.5 | 0.3 | 0.5 | 0.3 | 3.2 |
| *IB-13* | 2.9 | 2.1 | 1.6 | 0.3 | 0.3 | 0.5 | 0.8 | 1 | 9.5 |
| *IB-14* | 1.6 | 1 | 1 | 0.8 | 0.5 | 0.5 | 1 | 0.8 | 7.2 |
| *IB-15* | 2.1 | 1.3 | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 6.9 |
| *IB-16* | 1.6 | 1.3 | 1.3 | 0.8 | 0.3 | 0.3 | 1 | 1 | 7.6 |
| *IB-17* | 0.8 | 0.5 | 0.5 | | 0.3 | | | | 2.1 |
| *IB-18* | 0.5 | 0.5 | 0.5 | | | | | | 1.5 |
| *IB-19* | 1 | 1 | 1.3 | 0.5 | 0.3 | 0.5 | 0.5 | 0.5 | 5.6 |
| *IB-20* | 1 | 1 | 0.5 | | | 0.5 | 0.5 | 0.5 | 4 |
| *IB-21* | 1 | 1 | 1 | 1 | 0.5 | 0.5 | 0.5 | 0.8 | 6.3 |
| *IB-22* | 1 | 1 | 1.3 | 1.3 | 1 | 0.8 | 0.8 | 0.8 | 8 |
| *IB-23* | 1 | 0.8 | 0.8 | 0.3 | 0.5 | 0.3 | 0.5 | 0.5 | 4.7 |
| *IB-24* | 3.2 | 3.2 | 2.4 | 3.2 | 2.4 | 2.4 | 2.4 | 1.6 | 20.8 |
| *IB-25* | 0.5 | 0.5 | 0.5 | 0.3 | 0.3 | 0.5 | 0.5 | 0.5 | 3.6 |
| *IB-26* | 0.8 | 0.8 | 0.3 | 0.3 | | | 0.5 | 0.5 | 3.2 |
| *IB-27* | 1 | 1 | 0.5 | 1 | 0.5 | 0.5 | 1 | 0.8 | 6.3 |
| *IB-28* | 1 | 1 | 1 | 1 | 0.5 | | 1 | 1 | 6.5 |
| *IB-29* | 1 | 1 | 0.8 | 0.8 | 0.3 | 0.3 | 1 | 0.8 | 6 |
| *IB-30* | 1.8 | 1.3 | 1.8 | 0.8 | 0.3 | 0.3 | 1 | 1 | 8.3 |
| *IB-31* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 4 |
| *IB-32* | 0.3 | 0.3 | 0.5 | | 0.5 | 0.3 | 0.3 | 0.3 | 2.5 |
| *IB-33* | 0.8 | 0.5 | 0.5 | 0.8 | 0.5 | 0.5 | 0.5 | 0.5 | 4.6 |
| *IB-34* | | | | | | | | | |
| *IB-35* | 1 | 0.8 | 0.5 | 0.5 | 0.5 | 0.8 | 0.8 | 0.8 | 5.7 |
| *IB-36* | 2.6 | 1.6 | 1.3 | 1 | 1 | 0.8 | 1 | 1 | 10.3 |
| *IB-37* | 2.9 | 2.6 | 1.3 | 1.8 | 1 | 1.3 | 1.3 | 1 | 13.2 |
| *IB-38* | 0.5 | 0.5 | 0.5 | 0.3 | 0.5 | | | | 2.3 |
| *IB-39* | 0.8 | 0.8 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 4.6 |
| *Total* | 60.6 | 54.4 | 43.6 | 42.1 | 29.1 | 28.6 | 39.2 | 36.3 | 333.9 |

## *Normalised Weights of Impacts*

# *From 5-20 Millions*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.43 | 0.71 | 0.36 | | 0.36 | 0.71 | | | 3.57 |
| *AG-2* | | | | | | | | | |
| *AG-3* | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.71 | 0.71 | 3.58 |
| *AG-4* | | | | | | | | | |
| *Total* | 1.79 | 1.07 | 0.72 | 0.36 | 0.72 | 1.07 | 0.71 | 0.71 | 7.15 |
| *MM-1* | 0.71 | 0.71 | 0.71 | | 0.71 | 0.71 | 0.71 | 0.71 | 4.97 |
| *MM-2* | | | | | | | | | |
| *MM-3* | | | | | | | | | |
| *MM-4* | | | | | | | | | |
| *MM-5* | 0.71 | 0.71 | 0.71 | | | | | | 2.13 |
| *MM-6* | 0.71 | 0.71 | | 0.36 | 0.36 | | | | 2.14 |
| *Total* | 2.13 | 2.13 | 1.42 | 0.36 | 1.07 | 0.71 | 0.71 | 0.71 | 9.24 |
| *SC-1* | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | | 2.52 |
| *SC-2* | 3.57 | 2.14 | 2.14 | 1.07 | 0.71 | 0.71 | 1.43 | 1.78 | 13.55 |
| *SC-3* | | | | | | | | | |
| *SC-4* | 0.36 | 0.36 | 0.36 | | 0.36 | 0.71 | 0.71 | 0.71 | 3.57 |
| *Total* | 3.93 | 2.5 | 2.5 | 1.07 | 1.07 | 1.42 | 2.14 | 2.49 | 17.12 |
| *MD-1* | 0.36 | 0.71 | 0.36 | 0.71 | 0.71 | 0.71 | 0.71 | 0.71 | 4.98 |
| *MD-2* | | 0.36 | 0.36 | | | | 0.36 | | 1.08 |
| *MD-Man* | 2.14 | 0.71 | 1.07 | 0.71 | 0.36 | | 1.43 | 1.07 | 7.49 |
| *MD-E* | 1.07 | 0.71 | 1.07 | 0.36 | 0.36 | | 0.36 | 0.71 | 4.64 |
| *MD-M* | 1.07 | 1.07 | 0.71 | 0.36 | 0.36 | 0.36 | 0.71 | 0.71 | 5.35 |
| *MD-P* | | 0.36 | | | | | | | 0.36 |
| *MD-T* | | 0.36 | | | | | | | 0.36 |
| *MD-else* | | | | | | | | | |
| *Total* | 4.64 | 4.28 | 3.57 | 2.14 | 1.79 | 1.07 | 3.57 | 3.2 | 24.26 |
| *CA-1* | 2.14 | 0.71 | 0.71 | 0.71 | 0.71 | 0.71 | 1.07 | 1.07 | 7.83 |
| *CA-2* | 5 | 5 | 2.85 | 0.71 | 1.43 | 1.43 | 3.93 | 3.6 | 23.95 |
| *CA-3* | 2.14 | 1.07 | 1.07 | | | | 0.71 | 1.07 | 6.06 |
| *CA-4* | 2.8 | 2.14 | 1.07 | 0.36 | 0.71 | 0.36 | 1.07 | 2.8 | 11.31 |
| *CA-5* | 3.21 | 2.5 | 2.5 | 1.07 | 2.14 | 1.78 | 2.14 | 2.14 | 17.48 |
| *CA-6* | 2.8 | 3.5 | 3.5 | 1.43 | 1.43 | 1.78 | 2.8 | 3.6 | 20.84 |
| *CA-7* | 0.36 | | | | | | | | 0.36 |
| *CA-8* | 3.57 | 2.8 | 2.14 | 1.07 | 0.71 | 1.07 | 2.14 | 2.14 | 15.64 |
| *CA-9* | 1.43 | 2.14 | 1.43 | 0.71 | 0.71 | 0.71 | 1.07 | 1.43 | 9.63 |
| *CA-10* | 5 | 3.9 | 3.9 | 2.14 | 0.71 | 1.07 | 2.14 | 2.14 | 21 |
| *CA-11* | 5 | 3.9 | 2.8 | 1.43 | 0.71 | 1.07 | 2.14 | 3.5 | 20.55 |
| *CA-12* | 5.7 | 5 | 5 | 1.78 | 1.43 | 1.78 | 2.5 | 2.14 | 25.33 |
| *CA-13* | 2.8 | 2.14 | 2.8 | 1.07 | 1.07 | 0.71 | 2.14 | 1.78 | 14.51 |
| *CA-14* | 1.78 | 1.78 | 0.71 | 1.43 | 0.71 | 0.71 | 1.43 | 2.14 | 10.69 |
| *CA-15* | 1.78 | 1.43 | 0.71 | 0.71 | 0.71 | 0.71 | 1.07 | 1.07 | 8.19 |
| *CA-16* | 1.78 | 2.5 | 1.43 | 1.07 | 0.71 | 0.71 | 0.71 | 1.43 | 10.34 |
| *CA-17* | 0.71 | 1.43 | 1.43 | 1.07 | 0.71 | 0.71 | 1.07 | 1.07 | 8.2 |
| *CA-18* | 2.8 | 2.14 | 2.5 | 2.14 | 1.07 | 1.43 | 2.14 | 2.14 | 16.36 |
| *CA-19* | 1.78 | 2.14 | 1.78 | 1.43 | 1.07 | 0.71 | 1.43 | 1.43 | 11.77 |
| *CA-20* | 1.07 | 0.36 | 0.36 | | | | 0.71 | 0.71 | 3.21 |
| *Total* | 53.65 | 46.58 | 38.69 | 20.33 | 16.74 | 17.45 | 32.41 | 37.4 | 263.25 |

## *Normalised Weights of Impacts*

# *From 5-20 Millions*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 2.8 | 2.8 | 3.2 | 2.8 | 1.43 | 1.43 | 2.8 | 2.14 | 19.4 |
| *IB-2* | 2.14 | 2.14 | 1.78 | 2.14 | 1.07 | 1.43 | 2.14 | 1.78 | 14.62 |
| *IB-3* | 1.07 | 1.43 | 1.43 | 1.78 | 0.36 | 0.71 | 1.78 | 1.07 | 9.63 |
| *IB-4* | 0.71 | 0.71 | 0.71 | 0.71 | 0.36 | 0.36 | 0.71 | 0.36 | 4.63 |
| *IB-5* | 3.2 | 2.5 | 2.8 | 3.5 | 0.71 | 1.78 | 2.8 | 2.8 | 20.09 |
| *IB-6* | 2.14 | 1.43 | 1.07 | 1.07 | 0.36 | 0.36 | 1.07 | 1.43 | 8.93 |
| *IB-7* | 0.71 | 0.36 | 0.36 | 0.71 | 0.36 | 0.71 | 0.36 | 0.71 | 4.28 |
| *IB-8* | 3.5 | 2.14 | 2.5 | 2.5 | 1.07 | 1.43 | 2.8 | 2.8 | 18.74 |
| *IB-9* | 1.78 | 1.43 | 1.78 | 1.07 | 0.36 | 0.71 | 1.43 | 1.43 | 9.99 |
| *IB-10* | 2.14 | 2.8 | 1.78 | 2.14 | 1.07 | 0.71 | 1.43 | 1.43 | 13.5 |
| *IB-11* | 3.5 | 4.6 | 2.5 | 1.78 | 1.43 | 1.43 | 2.5 | 3.5 | 21.24 |
| *IB-12* | 1.78 | 1.78 | 0.36 | 0.71 | 0.36 | 0.36 | 0.71 | 1.43 | 7.49 |
| *IB-13* | 3.9 | 3.2 | 2.8 | 1.07 | 1.07 | 1.07 | 2.14 | 2.14 | 17.39 |
| *IB-14* | 0.71 | 0.71 | 1.07 | 1.07 | 0.71 | 0.71 | 0.71 | 0.71 | 6.4 |
| *IB-15* | 3.5 | 2.5 | 1.78 | 0.71 | 0.71 | 0.71 | 1.43 | 1.43 | 12.77 |
| *IB-16* | 2.8 | 2.14 | 2.14 | 0.36 | 0.71 | 0.36 | 1.07 | 1.07 | 10.65 |
| *IB-17* | 0.36 | 0.36 | | | | | | | 0.72 |
| *IB-18* | 2.14 | 1.78 | 1.43 | 0.36 | 0.71 | | 0.71 | 0.71 | 7.84 |
| *IB-19* | 0.71 | 0.71 | 0.36 | | | | 0.36 | 0.36 | 2.5 |
| *IB-20* | 2.5 | 2.14 | 1.43 | 1.07 | 1.43 | 1.07 | 1.07 | 0.71 | 11.42 |
| *IB-21* | 0.71 | 1.43 | 1.07 | 0.71 | 0.36 | 0.36 | 0.71 | 1.07 | 6.42 |
| *IB-22* | 2.14 | 2.5 | 1.78 | 2.14 | 1.43 | 1.43 | 1.43 | 1.43 | 14.28 |
| *IB-23* | 0.36 | 0.71 | 0.36 | 1.07 | | | | | 2.5 |
| *IB-24* | 2.5 | 2.5 | 2.14 | 2.5 | 1.43 | 1.43 | 1.43 | 1.07 | 15 |
| *IB-25* | 3.5 | 3.5 | 2.5 | 1.07 | 1.07 | 0.71 | 1.43 | 1.43 | 15.21 |
| *IB-26* | 1.78 | 1.43 | 1.43 | 0.71 | 0.71 | 0.71 | 0.71 | 0.71 | 8.19 |
| *IB-27* | 2.5 | 1.07 | 2.14 | 0.71 | 0.36 | 0.36 | 0.71 | 1.07 | 8.92 |
| *IB-28* | 2.14 | 0.71 | 1.43 | 1.43 | 0.36 | 0.36 | 1.43 | 1.43 | 9.29 |
| *IB-29* | 1.43 | 0.71 | 1.07 | 1.43 | 0.71 | 0.71 | 1.07 | 1.07 | 8.2 |
| *IB-30* | 2.14 | 0.71 | 1.43 | 1.07 | 0.71 | 0.36 | 1.43 | 1.43 | 9.28 |
| *IB-31* | 2.5 | 0.71 | 1.07 | 1.07 | 0.36 | 0.36 | 1.43 | 1.43 | 8.93 |
| *IB-32* | 2.14 | 2.8 | 2.8 | 1.43 | 1.43 | 1.43 | 1.43 | 1.43 | 14.89 |
| *IB-33* | 1.43 | 1.07 | 1.07 | 1.07 | 0.36 | 0.71 | 0.36 | 0.36 | 6.43 |
| *IB-34* | 0.36 | 0.36 | 0.71 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 3.23 |
| *IB-35* | 0.71 | 0.71 | 0.36 | 0.71 | 0.36 | 0.36 | 0.36 | 0.36 | 3.93 |
| *IB-36* | 2.8 | 2.8 | 1.43 | 1.78 | 1.07 | 1.07 | 1.78 | 1.78 | 14.51 |
| *IB-37* | 3.9 | 3.2 | 1.78 | 2.14 | 1.07 | 1.07 | 1.43 | 2.14 | 16.73 |
| *IB-38* | 1.43 | 0.71 | 0.71 | 1.43 | 0.71 | 0.36 | 0.71 | 0.71 | 6.77 |
| *IB-39* | 3.9 | 5.35 | 1.78 | 1.43 | 1.07 | 1.07 | 1.78 | 2.14 | 18.52 |
| *Total* | 80.46 | 70.64 | 58.34 | 49.81 | 28.21 | 28.56 | 48.01 | 49.43 | 413.46 |

## *Normalised Weights of Impacts*

# *More Than 20 Millions*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.8 | 1.5 | 1.2 | 1.5 | 0.9 | 1.2 | 1.5 | 1.2 | 10.8 |
| *AG-2* | 0.6 | 0.6 | 0.6 | | 0.3 | 0.3 | | 0.6 | 3 |
| *AG-3* | 0.6 | 0.6 | | 0.3 | | | | | 1.5 |
| *AG-4* | 0.6 | 0.6 | | 0.3 | 0.3 | 0.6 | 0.3 | 0.3 | 3 |
| *Total* | 3.6 | 3.3 | 1.8 | 2.1 | 1.5 | 2.1 | 1.8 | 2.1 | 18.3 |
| *MM-1* | 1.8 | 1.5 | 1.5 | 0.9 | 3 | 1.2 | 1.2 | 1.5 | 12.6 |
| *MM-2* | | | | | | | | | |
| *MM-3* | 0.3 | 0.3 | 0.3 | | | | | | 0.9 |
| *MM-4* | | | | | | | | | |
| *MM-5* | 1.8 | 1.8 | 1.5 | 1.2 | 1.5 | 1.2 | 1.2 | 1.8 | 12 |
| *MM-6* | 0.6 | 0.6 | | | | | | | 1.2 |
| *Total* | 4.5 | 4.2 | 3.3 | 2.1 | 4.5 | 2.4 | 2.4 | 3.3 | 26.7 |
| *SC-1* | 0.9 | 1.2 | 0.3 | 0.6 | 0.3 | 0.3 | 0.3 | 0.6 | 4.5 |
| *SC-2* | 0.9 | 3.8 | 2.6 | 1.2 | 1.2 | 1.2 | 1.5 | 1.8 | 14.2 |
| *SC-3* | | | | | | | | | |
| *SC-4* | 1.8 | 1.2 | 1.2 | 0.6 | 0.6 | 0.9 | 1.2 | 1.2 | 8.7 |
| *Total* | 3.6 | 6.2 | 4.1 | 2.4 | 2.1 | 2.4 | 3 | 3.6 | 27.4 |
| *MD-1* | 1.2 | 2.4 | 1.8 | 0.6 | 0.6 | 0.6 | 1.2 | 1.5 | 9.9 |
| *MD-2* | 1.2 | 2.6 | 1.5 | 0.9 | 0.9 | 0.9 | 1.2 | 1.5 | 10.7 |
| *MD-Man* | 2.9 | 2.4 | 2.4 | 1.5 | 0.9 | 1.5 | 2 | 2.4 | 16 |
| *MD-E* | 1.5 | 1.5 | 1.2 | 0.9 | 0.9 | 1.2 | 1.5 | 1.5 | 10.2 |
| *MD-M* | 2 | 1.5 | 1.5 | 1.2 | 0.9 | 1.2 | 1.5 | 2 | 11.8 |
| *MD-P* | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.3 | 0.6 | 0.6 | 4.5 |
| *MD-T* | | | | | | | | | |
| *MD-else* | | | | | | | | | |
| *Total* | 9.4 | 11 | 9 | 5.7 | 4.8 | 5.7 | 8 | 9.5 | 63.1 |
| *CA-1* | 3.2 | 2.4 | 2 | 0.2 | 0.6 | 0.9 | 2 | 2.6 | 13.9 |
| *CA-2* | 8 | 8.2 | 6 | 2.4 | 2.4 | 2.6 | 4.4 | 5.9 | 39.9 |
| *CA-3* | 1.2 | 0.6 | 0.6 | | 0.3 | 0.6 | 0.9 | 1.2 | 5.4 |
| *CA-4* | 1.5 | 1.2 | 1.2 | 0.6 | 0.9 | 1.2 | 1.8 | 1.8 | 10.2 |
| *CA-5* | 1.5 | 1.2 | 0.6 | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 | 6 |
| *CA-6* | 1.8 | 1.5 | 1.5 | 1.2 | 0.6 | 1.2 | 1.5 | 1.5 | 10.8 |
| *CA-7* | 1.2 | 1.5 | 1.2 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 6.9 |
| *CA-8* | 4 | 2.9 | 3.8 | 1.5 | 2 | 2.9 | 3.2 | 3.2 | 23.5 |
| *CA-9* | 1.8 | 2.4 | 1.2 | 0.3 | 0.6 | 0.6 | 1.2 | 1.5 | 9.6 |
| *CA-10* | 3.5 | 3.5 | 3.2 | 2.4 | 2.6 | 2.4 | 2.9 | 3.2 | 23.7 |
| *CA-11* | 2.6 | 3.8 | 2.4 | 0.9 | 1.2 | 1.2 | 2.6 | 3.2 | 17.9 |
| *CA-12* | 3.2 | 3.5 | 2.4 | 1.2 | 1.5 | 1.2 | 2 | 2.6 | 17.6 |
| *CA-13* | 3.5 | 2.9 | 2.4 | 1.8 | 1.5 | 2 | 2.4 | 3.2 | 19.7 |
| *CA-14* | 0.6 | 0.6 | 0.3 | 0.6 | 0.3 | 0.3 | 0.3 | 0.6 | 3.6 |
| *CA-15* | 2.4 | 1.8 | 1.5 | 0.6 | 0.9 | 0.6 | 1.2 | 1.5 | 10.5 |
| *CA-16* | 2.4 | 2.4 | 1.2 | 1.2 | 0.9 | 0.9 | 1.5 | 2 | 12.5 |
| *CA-17* | 1.8 | 1.8 | 1.2 | 1.2 | 0.9 | 0.9 | 2 | 2 | 11.8 |
| *CA-18* | 2.4 | 2.6 | 1.5 | 1.8 | 0.9 | 1.2 | 1.8 | 2.4 | 14.6 |
| *CA-19* | 2 | 1.8 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 1.2 | 8 |
| *CA-20* | 2 | 2 | 1.8 | 0.9 | 0.9 | 1.2 | 1.5 | 1.5 | 11.8 |
| *Total* | 50.6 | 48.6 | 36.6 | 20.3 | 20.8 | 23.7 | 35 | 42.3 | 277.9 |

## *Normalised Weights of Impacts*

# *More Than 20 Millions*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-1* | 4 | 3.5 | 2.9 | 3.5 | 2.4 | 2.9 | 3.2 | 3.5 | 25.9 |
| *IB-2* | 1.2 | 1.8 | 1.2 | 1.5 | 0.6 | 1.2 | 1.2 | 1.2 | 9.9 |
| *IB-3* | 2 | 2.4 | 1.8 | 2.4 | 1.2 | 1.8 | 1.8 | 1.8 | 15.2 |
| *IB-4* | 0.9 | 0.9 | 0.6 | 0.6 | 0.9 | 0.9 | 0.6 | 0.6 | 6 |
| *IB-5* | 2.4 | 2.6 | 2.9 | 2.6 | 1.5 | 1.8 | 2.4 | 2.4 | 18.6 |
| *IB-6* | 1.2 | 0.9 | 0.9 | 0.9 | 0.6 | 0.9 | 1.8 | 1.8 | 9 |
| *IB-7* | 2.9 | 2.6 | 2.6 | 2 | 1.5 | 1.5 | 2.4 | 2.4 | 17.9 |
| *IB-8* | 4.7 | 4.7 | 3.8 | 3.5 | 2.6 | 2.6 | 3.8 | 3.5 | 29.2 |
| *IB-9* | 2 | 2 | 1.8 | 1.8 | 1.2 | 1.8 | 2 | 2 | 14.6 |
| *IB-10* | 2.9 | 2.9 | 2.4 | 2.4 | 1.8 | 1.5 | 2.4 | 2.4 | 18.7 |
| *IB-11* | 4.4 | 5 | 3.5 | 2.4 | 2.4 | 2.4 | 3.2 | 3.5 | 26.8 |
| *IB-12* | 1.8 | 2.4 | 1.2 | 0.9 | 0.9 | 1.2 | 1.2 | 1.8 | 11.4 |
| *IB-13* | 4.7 | 3.5 | 2.9 | 1.8 | 2 | 1.8 | 3.2 | 3.5 | 23.4 |
| *IB-14* | 3.8 | 2.9 | 2.9 | 1.8 | 1.8 | 1.8 | 2.6 | 2.6 | 20.2 |
| *IB-15* | 4.1 | 3.2 | 3.2 | 2 | 2 | 2 | 2.9 | 3.2 | 22.6 |
| *IB-16* | 3.5 | 3.2 | 2.9 | 1.8 | 1.5 | 1.5 | 2.9 | 3.2 | 20.5 |
| *IB-17* | 1.8 | 1.5 | 1.5 | 0.9 | 1.2 | 1.2 | 1.5 | 1.5 | 11.1 |
| *IB-18* | 2.4 | 2.9 | 1.8 | 0.9 | 0.9 | 0.6 | 2.4 | 2.4 | 14.3 |
| *IB-19* | 1.5 | 1.5 | 1.2 | 0.9 | 0.9 | 0.9 | 1.2 | 1.2 | 9.3 |
| *IB-20* | 2.9 | 2.6 | 2.4 | 1.2 | 1.2 | 1.5 | 2.6 | 2.6 | 17 |
| *IB-21* | 0.3 | 0.6 | 0.3 | 0.6 | 0.3 | 0.3 | 0.6 | 0.6 | 3.6 |
| *IB-22* | 2.4 | 2 | 1.5 | 1.8 | 0.9 | 1.2 | 1.5 | 1.2 | 12.5 |
| *IB-23* | 2.6 | 2.4 | 2.4 | 1.8 | 1.5 | 1.8 | 2 | 2.4 | 16.9 |
| *IB-24* | 1.8 | 2.4 | 1.2 | 1.2 | 0.6 | 0.9 | 1.2 | 1.5 | 10.8 |
| *IB-25* | 2.6 | 2 | 2 | 1.2 | 1.5 | 1.2 | 2.4 | 2.4 | 15.3 |
| *IB-26* | 2.9 | 2.6 | 1.8 | 1.2 | 1.2 | 1.2 | 2.9 | 2.9 | 16.7 |
| *IB-27* | 4.1 | 3.2 | 2.6 | 2.4 | 2 | 2 | 2.4 | 2.6 | 21.3 |
| *IB-28* | 3.5 | 2.6 | 2.4 | 2.4 | 1.8 | 2 | 2 | 2 | 18.7 |
| *IB-29* | 2.4 | 1.8 | 1.8 | 1.8 | 1.5 | 1.8 | 1.8 | 1.8 | 14.7 |
| *IB-30* | 3.8 | 2.6 | 2.9 | 2 | 1.8 | 2 | 2.6 | 2.4 | 20.1 |
| *IB-31* | 2.6 | 2.4 | 1.8 | 1.8 | 1.5 | 1.8 | 2 | 2 | 15.9 |
| *IB-32* | 2.6 | 2.6 | 1.5 | 1.2 | 1.5 | 1.5 | 1.8 | 1.8 | 14.5 |
| *IB-33* | 2.9 | 2.6 | 2.9 | 2.4 | 1.8 | 2 | 2.4 | 2.4 | 19.4 |
| *IB-34* | 1.8 | 1.8 | 1.8 | 1.5 | 1.2 | 0.9 | 1.8 | 1.8 | 12.6 |
| *IB-35* | 1.8 | 1.8 | 1.2 | 1.2 | 0.9 | 0.9 | 2 | 1.8 | 11.6 |
| *IB-36* | 2.4 | 2 | 1.5 | 2 | 0.9 | 0.9 | 1.8 | 1.8 | 13.3 |
| *IB-37* | 3.8 | 2.9 | 1.8 | 1.8 | 1.2 | 0.9 | 2.6 | 2.6 | 17.6 |
| *IB-38* | 2.4 | 2 | 1.8 | 1.5 | 1.2 | 0.9 | 2.6 | 2.4 | 14.8 |
| *IB-39* | 2.4 | 3.5 | 1.8 | 1.2 | 1.2 | 1.2 | 2.4 | 2.6 | 16.3 |
| *Total* | 104.2 | 96.8 | 79.4 | 66.8 | 53.6 | 57.2 | 84.1 | 86.1 | 628.2 |

## *Normalised Weights of Impacts*

# *Total Sample Size*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *AG-1* | 1.6 | 1.1 | 1 | 1.2 | 0.8 | 1 | 0.8 | 0.9 | 8.4 |
| *AG-2* | 0.2 | 0.2 | 0.2 | | 0.1 | 0.1 | | 0.2 | 1 |
| *AG-3* | 0.4 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 1.6 |
| *AG-4* | 0.2 | 0.2 | | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 1 |
| *Total* | 2.4 | 1.7 | 1.4 | 1.5 | 1.1 | 1.4 | 1.1 | 1.4 | 12 |
| *MM-1* | 0.8 | 0.7 | 0.7 | 0.4 | 0.4 | 0.5 | 0.5 | 0.7 | 4.7 |
| *MM-2* | | | | | | | | | |
| *MM-3* | 0.1 | 0.1 | 0.1 | | | | | | 0.3 |
| *MM-4* | | 0.1 | | | | 0.1 | | 0.1 | 0.3 |
| *MM-5* | 1.2 | 1.2 | 0.9 | 0.5 | 0.7 | 0.5 | 0.5 | 0.9 | 6.4 |
| *MM-6* | 0.6 | 0.6 | 0.4 | 0.5 | 0.4 | 0.1 | 0.2 | 0.2 | 3 |
| *Total* | 2.7 | 2.7 | 2.1 | 1.4 | 1.5 | 1.2 | 1.2 | 1.9 | 14.7 |
| *SC-1* | 0.6 | 0.6 | 0.6 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 3.3 |
| *SC-2* | 2.9 | 2.7 | 2.2 | 1.3 | 1.1 | 1.2 | 1.4 | 1.5 | 14.3 |
| *SC-3* | | 1 | 2 | | | | | | 3 |
| *SC-4* | 0.7 | 0.5 | 0.6 | 0.2 | 0.3 | 0.5 | 0.5 | 0.5 | 3.8 |
| *Total* | 4.2 | 4.8 | 5.4 | 1.9 | 1.7 | 2 | 2.2 | 2.2 | 24.4 |
| *MD-1* | 0.8 | 1.4 | 0.9 | 0.6 | 0.6 | 0.6 | 0.7 | 0.8 | 6.4 |
| *MD-2* | 0.4 | 1 | 0.6 | 0.3 | 0.3 | 0.3 | 0.5 | 0.5 | 3.9 |
| *MD-Man* | 2.6 | 1.8 | 1 | 1.4 | 0.8 | 0.9 | 1.6 | 1.8 | 11.9 |
| *MD-E* | 1 | 0.8 | 1 | 0.6 | 0.4 | 0.6 | 0.8 | 0.9 | 6.1 |
| *MD-M* | 1.3 | 1 | 1 | 0.6 | 0.5 | 0.5 | 0.9 | 1.1 | 6.9 |
| *MD-P* | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 1.5 |
| *MD-T* | | 0.1 | | | | | | | 0.1 |
| *MD-else* | | | | | | | | | |
| *Total* | 6.3 | 6.3 | 4.7 | 3.7 | 2.8 | 3 | 4.7 | 5.3 | 36.8 |
| *CA-1* | 2.1 | 1.5 | 1.3 | 1.3 | 0.6 | 0.8 | 1.4 | 1.6 | 10.6 |
| *CA-2* | 5.4 | 5.8 | 3.9 | 1.9 | 1.7 | 1.8 | 3.4 | 4 | 27.9 |
| *CA-3* | 1.4 | 0.8 | 0.8 | 0.2 | 0.3 | 0.3 | 0.6 | 0.8 | 5.2 |
| *CA-4* | 2 | 1.6 | 1.4 | 0.9 | 0.8 | 0.8 | 1.1 | 1.7 | 10.3 |
| *CA-5* | 1.8 | 1.6 | 1.2 | 1 | 1.2 | 1.2 | 1.3 | 1.3 | 10.6 |
| *CA-6* | 2 | 2.2 | 2 | 1.1 | 0.9 | 1.2 | 1.8 | 1.8 | 13 |
| *CA-7* | 0.6 | 0.5 | 0.4 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 2.5 |
| *CA-8* | 3.3 | 2.6 | 2.3 | 1.4 | 1.3 | 1.6 | 2.1 | 2.2 | 16.8 |
| *CA-9* | 1.2 | 1.6 | 0.9 | 0.4 | 0.5 | 0.5 | 0.9 | 1 | 7 |
| *CA-10* | 3.2 | 2.8 | 2.8 | 2 | 1.4 | 1.3 | 1.9 | 2 | 17.4 |
| *CA-11* | 2.8 | 3 | 2.2 | 0.9 | 0.7 | 0.9 | 2 | 2.3 | 14.8 |
| *CA-12* | 2.9 | 3 | 2.3 | 1.1 | 1 | 1.1 | 1.6 | 1.8 | 14.8 |
| *CA-13* | 2.5 | 2.2 | 2 | 1.3 | 1 | 1.1 | 1.6 | 1.9 | 13.6 |
| *CA-14* | 0.9 | 1 | 0.7 | 0.8 | 0.4 | 0.4 | 0.7 | 0.9 | 5.8 |
| *CA-15* | 2 | 1.8 | 1.1 | 0.8 | 0.9 | 0.8 | 1.3 | 1.4 | 10.1 |
| *CA-16* | 1.8 | 2 | 1.4 | 1.1 | 0.8 | 1 | 1.2 | 1.5 | 10.8 |
| *CA-17* | 1 | 1.5 | 1.1 | 1.1 | 0.6 | 0.6 | 1.3 | 1.4 | 8.6 |
| *CA-18* | 2.8 | 2.8 | 2.5 | 2.5 | 1.5 | 1.9 | 2.4 | 2.3 | 18.7 |
| *CA-19* | 1.7 | 1.4 | 1 | 0.9 | 0.6 | 0.5 | 0.9 | 1 | 8 |
| *CA-20* | 1.2 | 1 | 0.8 | 0.5 | 0.4 | 0.5 | 0.8 | 0.8 | 6 |
| *Total* | 42.6 | 40.7 | 32.1 | 21.4 | 16.8 | 18.5 | 28.5 | 31.9 | 232.5 |
| *IB-1* | 3.7 | 3.3 | 3.1 | 3.4 | 2.3 | 2.6 | 3.1 | 3 | 24.5 |

## *Normalised Weights of Impacts*

# *Total Sample Size*

| | *T* | *M* | *O* | *Q* | *F* | *L* | *P* | *R* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| *IB-2* | 1.6 | 1.6 | 1.2 | 1.7 | 0.8 | 1.2 | 1.6 | 1.3 | 11 |
| *IB-3* | 2 | 2.1 | 1.7 | 2.3 | 1.1 | 1.4 | 2 | 1.7 | 14.3 |
| *IB-4* | 0.7 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.6 | 0.5 | 4.6 |
| *IB-5* | 3.7 | 3.6 | 3.5 | 3.6 | 2 | 2.5 | 3.3 | 3 | 25.2 |
| *IB-6* | 1.7 | 1.5 | 1.1 | 1.1 | 0.7 | 0.8 | 1.2 | 1.3 | 9.4 |
| *IB-7* | 1.6 | 1.4 | 1.2 | 1.3 | 0.8 | 0.7 | 1 | 1.2 | 9.2 |
| *IB-8* | 4.1 | 3.5 | 3.1 | 3.2 | 2 | 1.9 | 3.1 | 3 | 23.9 |
| *IB-9* | 1.7 | 1.3 | 1.2 | 1 | 0.5 | 0.7 | 1.2 | 1.4 | 9 |
| *IB-10* | 2.4 | 2.8 | 2.1 | 2.3 | 1.6 | 1.4 | 2 | 1.8 | 16.4 |
| *IB-11* | 3.9 | 4.4 | 2.7 | 1.9 | 1.5 | 1.6 | 2.5 | 3 | 21.5 |
| *IB-12* | 1.2 | 1.4 | 0.7 | 0.6 | 0.6 | 0.6 | 0.8 | 1 | 6.9 |
| *IB-13* | 3.8 | 2.9 | 2.5 | 1 | 1.1 | 1.2 | 2 | 2.1 | 16.6 |
| *IB-14* | 2.1 | 1.6 | 1.6 | 1 | 1 | 0.9 | 1.4 | 1.4 | 11 |
| *IB-15* | 3.2 | 2.3 | 2 | 1.1 | 1.2 | 1 | 1.6 | 1.7 | 14.1 |
| *IB-16* | 2.6 | 2.2 | 2.1 | 1 | 0.9 | 0.8 | 1.7 | 1.8 | 13.1 |
| *IB-17* | 1 | 0.8 | 0.8 | 0.4 | 0.5 | 0.4 | 0.5 | 0.6 | 5 |
| *IB-18* | 1.6 | 1.7 | 1.2 | 0.5 | 0.6 | 0.3 | 1 | 1 | 7.9 |
| *IB-19* | 1 | 1.1 | 1 | 0.4 | 0.4 | 0.5 | 0.7 | 0.8 | 5.9 |
| *IB-20* | 2 | 1.9 | 1.4 | 0.7 | 0.7 | 1 | 1.3 | 1.2 | 10.2 |
| *IB-21* | 0.7 | 1 | 0.8 | 0.9 | 0.5 | 0.4 | 0.7 | 0.8 | 5.8 |
| *IB-22* | 1.8 | 1.8 | 1.5 | 1.7 | 1.1 | 1.1 | 1.2 | 1.2 | 11.4 |
| *IB-23* | 1.4 | 1.4 | 1.2 | 1 | 0.7 | 0.7 | 0.9 | 1 | 8.3 |
| *IB-24* | 2.4 | 2.8 | 1.9 | 2.3 | 1.5 | 1.5 | 1.7 | 1.4 | 15.5 |
| *IB-25* | 2.1 | 1.9 | 1.6 | 0.8 | 0.9 | 0.8 | 1.4 | 1.4 | 10.9 |
| *IB-26* | 1.8 | 1.6 | 1.1 | 0.6 | 0.6 | 0.6 | 1.4 | 1.4 | 9.1 |
| *IB-27* | 2.5 | 1.7 | 1.7 | 1.3 | 0.9 | 1 | 1.5 | 1.5 | 12.1 |
| *IB-28* | 2.3 | 1.5 | 1.5 | 1.6 | 0.9 | 0.8 | 1.6 | 1.5 | 11.7 |
| *IB-29* | 1.6 | 1.1 | 1.2 | 1.2 | 0.9 | 0.8 | 1.3 | 1.1 | 9.2 |
| *IB-30* | 2.7 | 1.6 | 2.1 | 1.2 | 0.9 | 0.9 | 1.7 | 1.6 | 12.7 |
| *IB-31* | 1.8 | 1.1 | 1.1 | 1.1 | 0.7 | 0.9 | 1.3 | 1.2 | 9.2 |
| *IB-32* | 1.6 | 1.8 | 1.4 | 0.8 | 1.1 | 0.9 | 1.1 | 1.1 | 9.8 |
| *IB-33* | 1.7 | 1.5 | 1.5 | 1.4 | 1 | 1 | 1.1 | 1 | 10.2 |
| *IB-34* | 0.7 | 0.7 | 0.7 | 0.6 | 0.6 | 0.4 | 0.7 | 0.6 | 5 |
| *IB-35* | 1.1 | 1.1 | 0.8 | 0.8 | 0.6 | 0.7 | 1 | 1 | 7.1 |
| *IB-36* | 2.6 | 2.2 | 1.4 | 1.7 | 1.1 | 1 | 1.5 | 1.6 | 13.1 |
| *IB-37* | 3.5 | 2.9 | 1.6 | 2 | 1 | 1.2 | 1.8 | 1.9 | 15.9 |
| *IB-38* | 1.5 | 1.2 | 0.9 | 0.9 | 0.7 | 0.4 | 1 | 1 | 7.6 |
| *IB-39* | 2.2 | 3 | 1.3 | 1.1 | 0.9 | 0.9 | 1.6 | 1.8 | 12.8 |
| *Total* | 81.6 | 73.9 | 60.1 | 52.1 | 37.4 | 38 | 57.1 | 56.9 | 457.1 |

# Appendix (C)

# Calculation of Weak/Strong Border of Frequency Readings

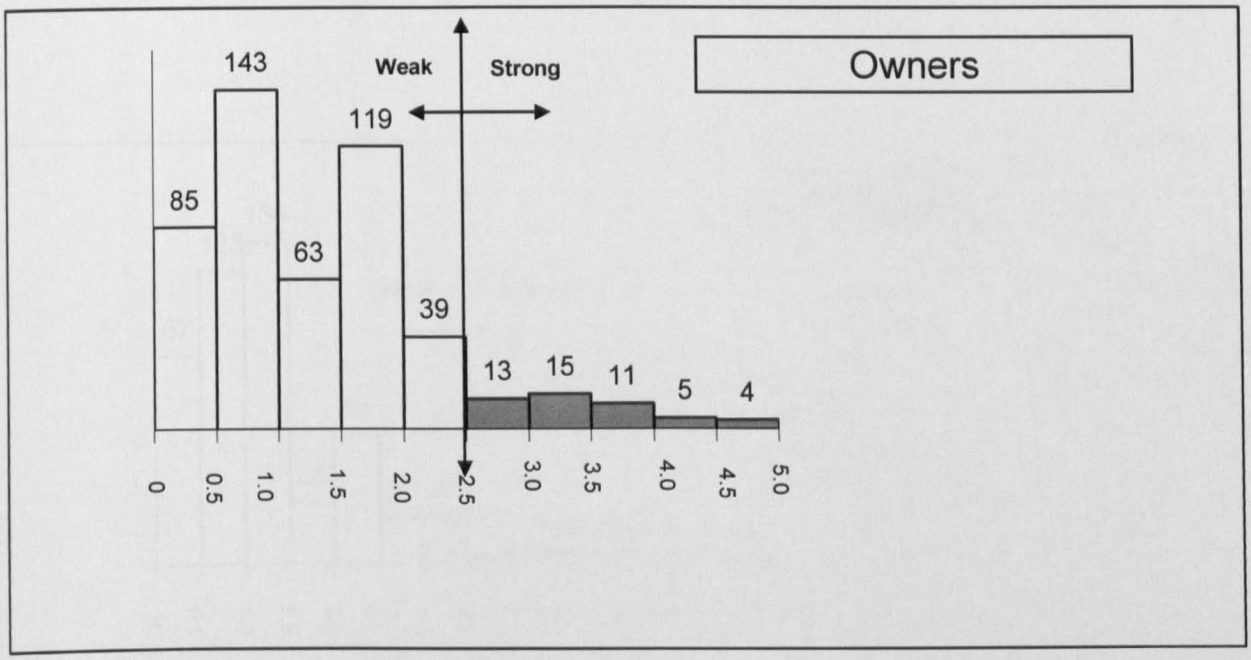



**Fig ( 66 ): Frequencies of claims impact in each cell ( Time, Money, ..... ) in relation to Owners (to determine the weak / strong border line)**

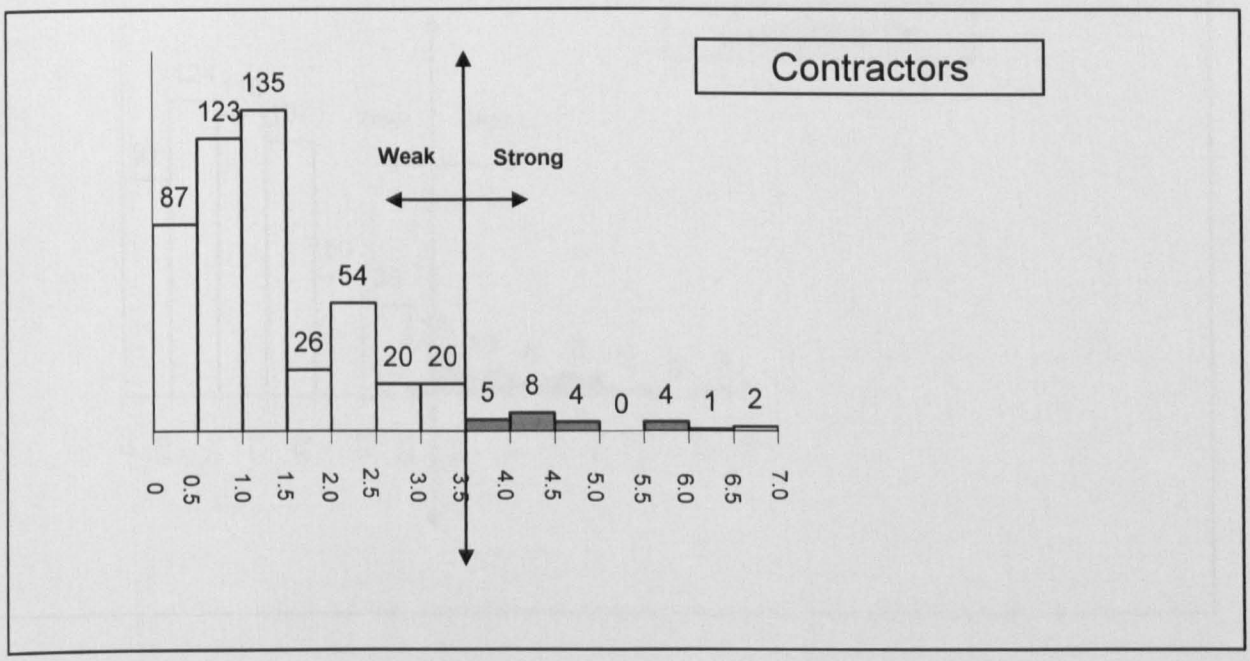



**Fig ( 67 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in relation to Contractors (to determine the weak / strong border line)**

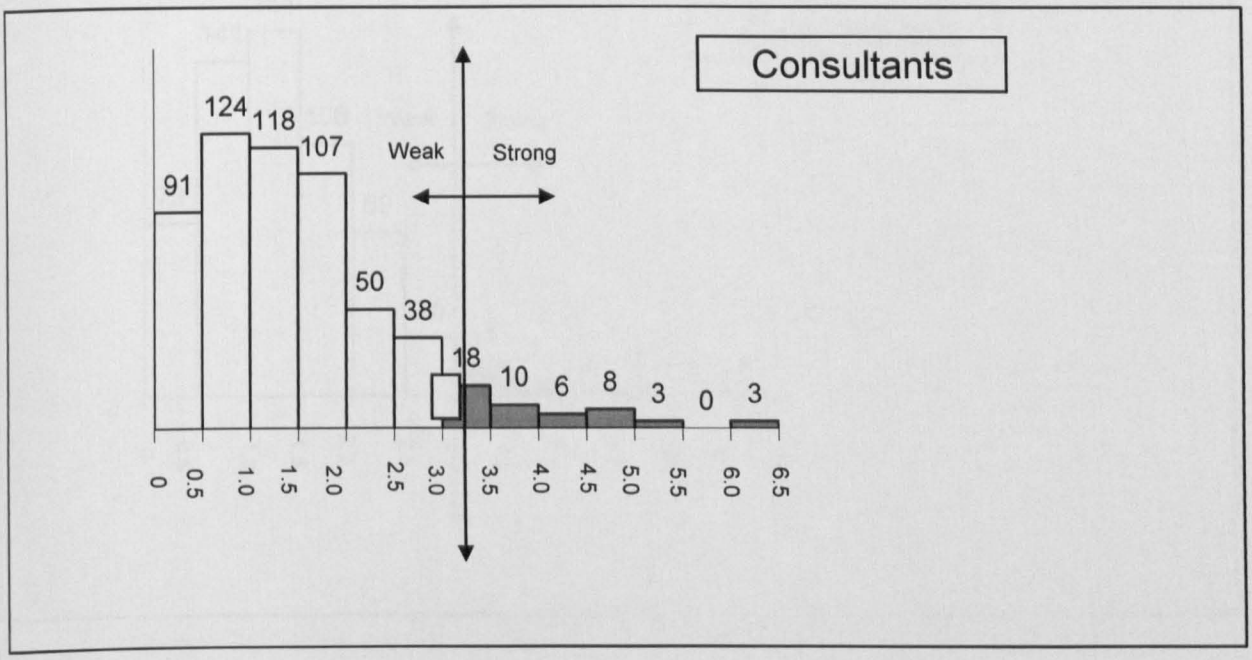



**Fig ( 68 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in relation to Consultants (to determine the weak / strong border line)**

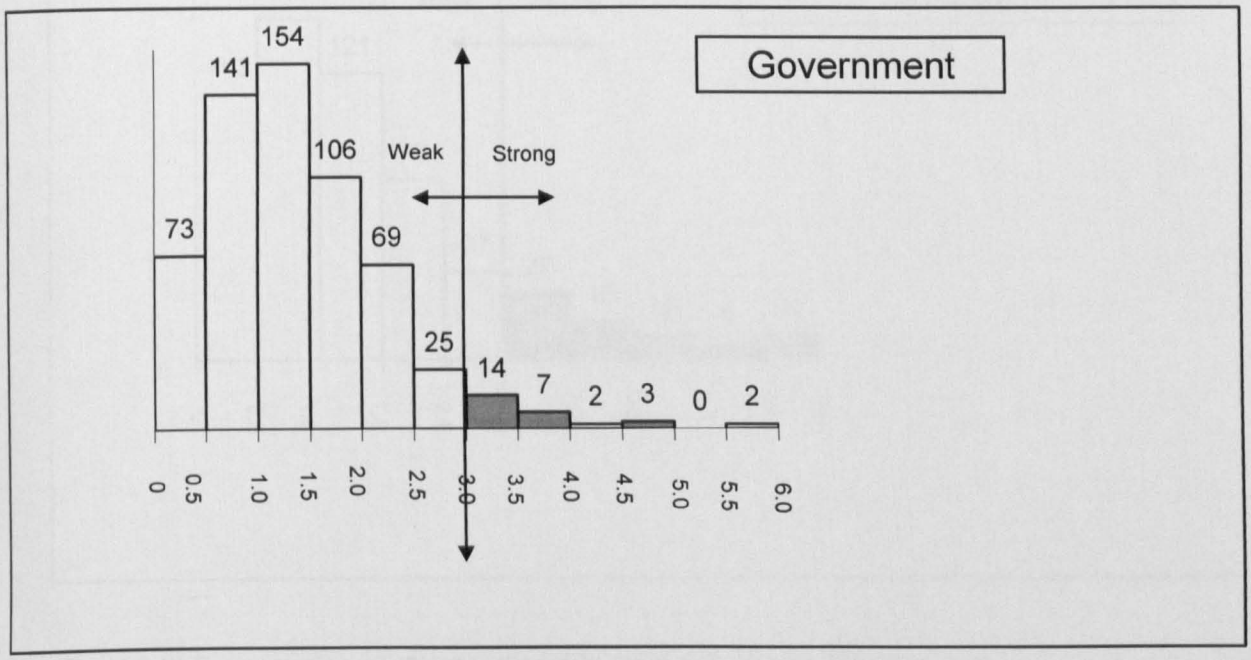



**Fig ( 69 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in Government projects (to determine the weak / strong border line)**

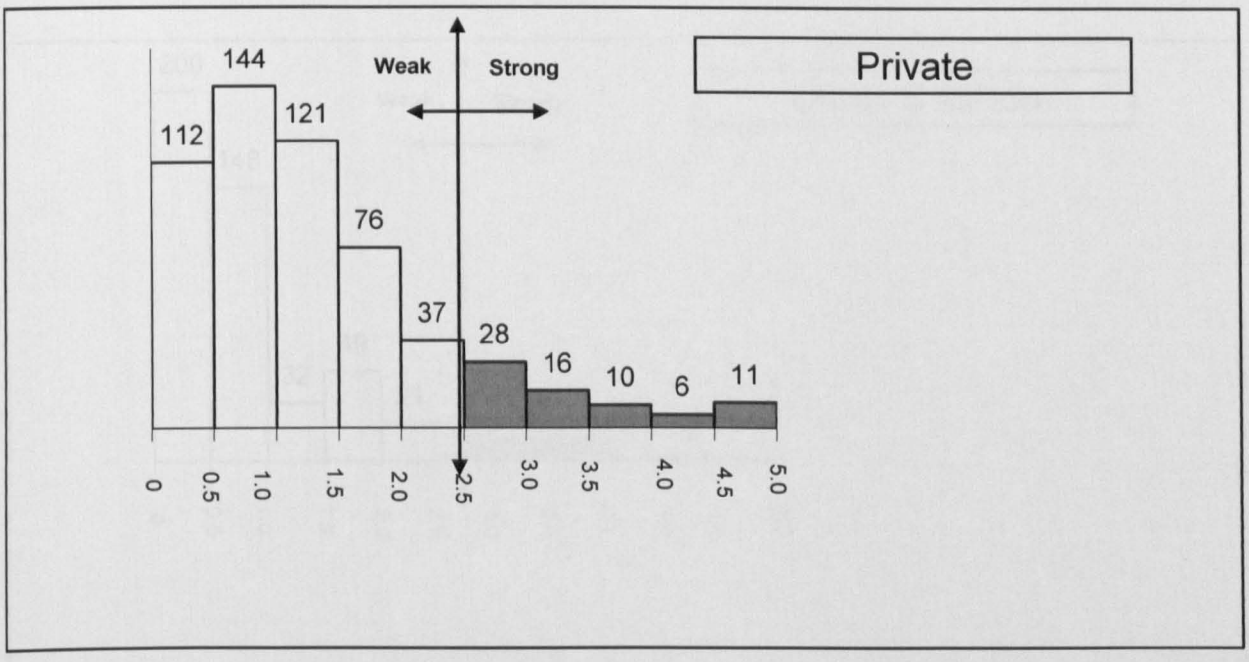



**Fig ( 70 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in Private projects (to determine the weak strong border line)**

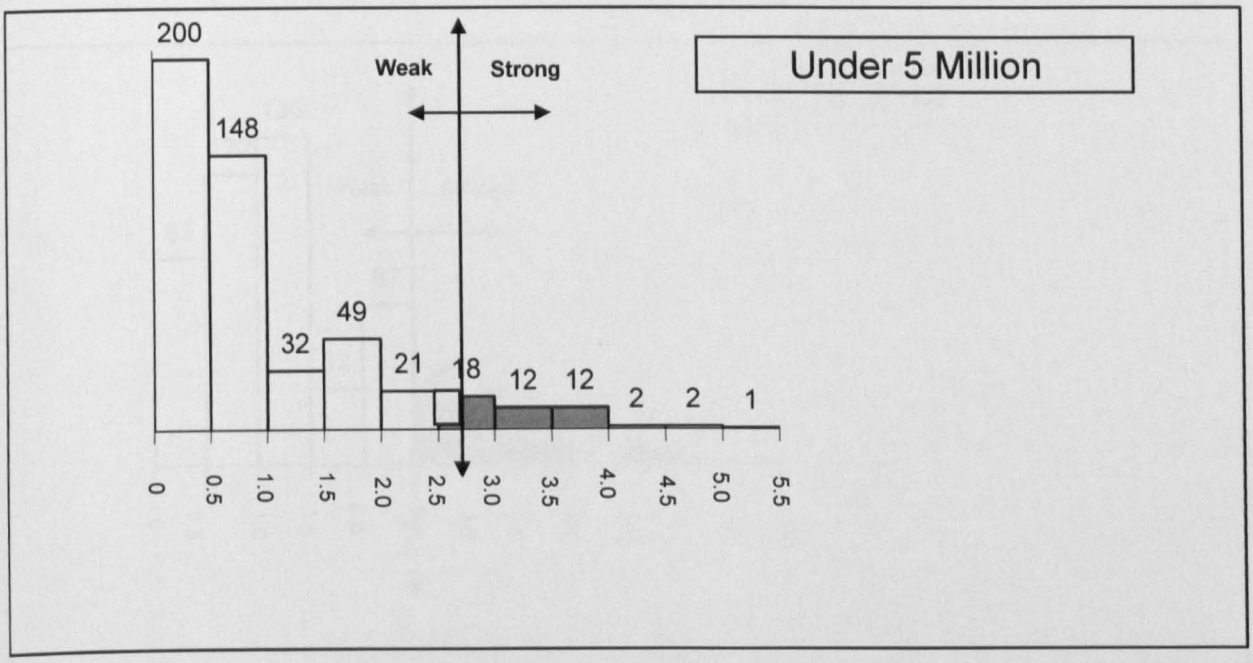



**Fig ( 71 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in Under 5 Million projects (to determine the weak / strong border line)**

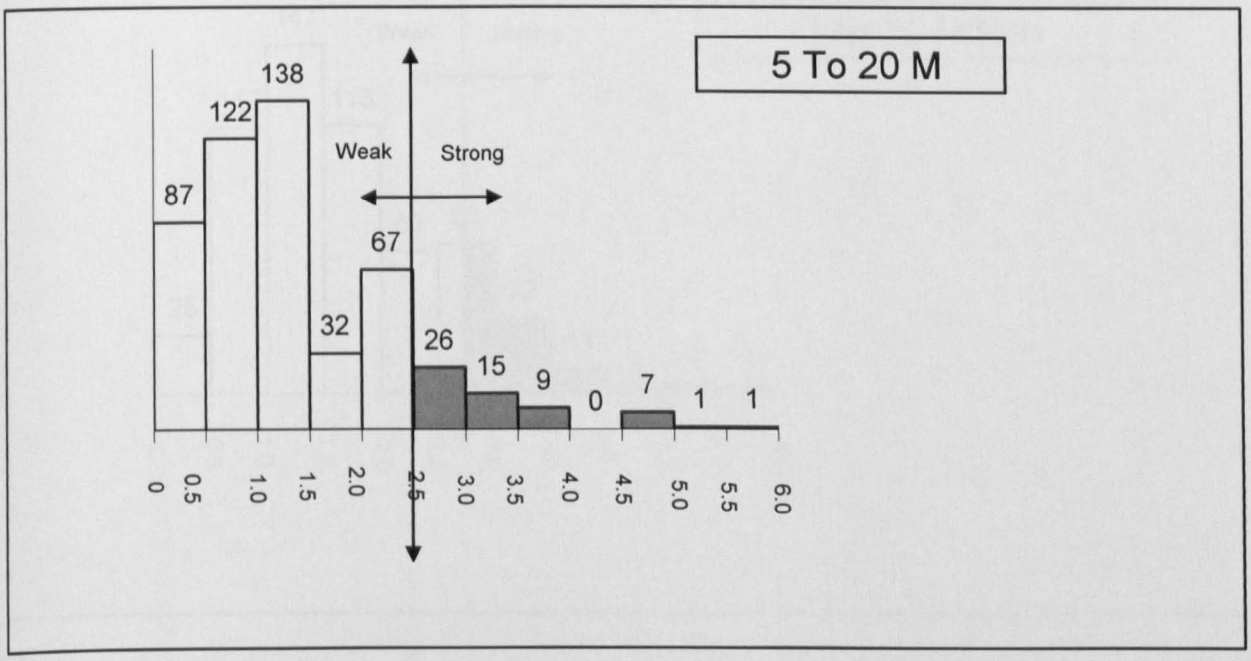



**Fig ( 72 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in 5 to 20 Million Riyals projects (to determine the weak / strong border line)**

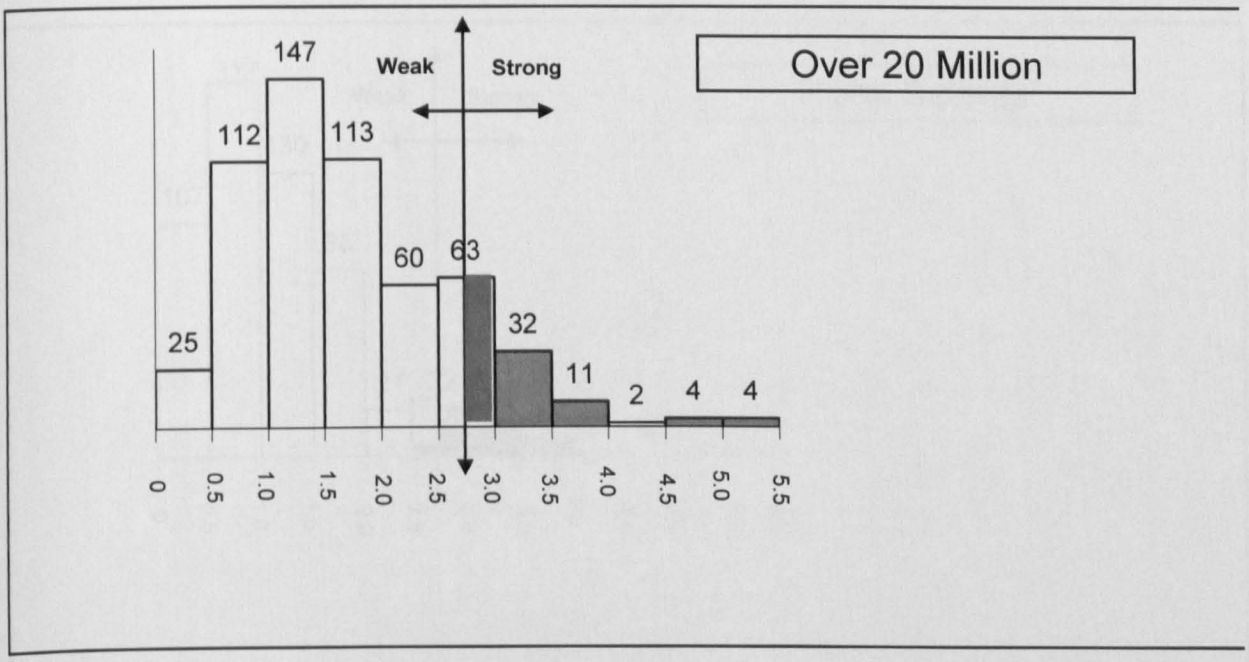



**Fig ( 73 ): Frequencies of claims impact in each cell ( Time, Money, ..... )**

**in Over 20 Million projects (to determine the weak / strong border line)**

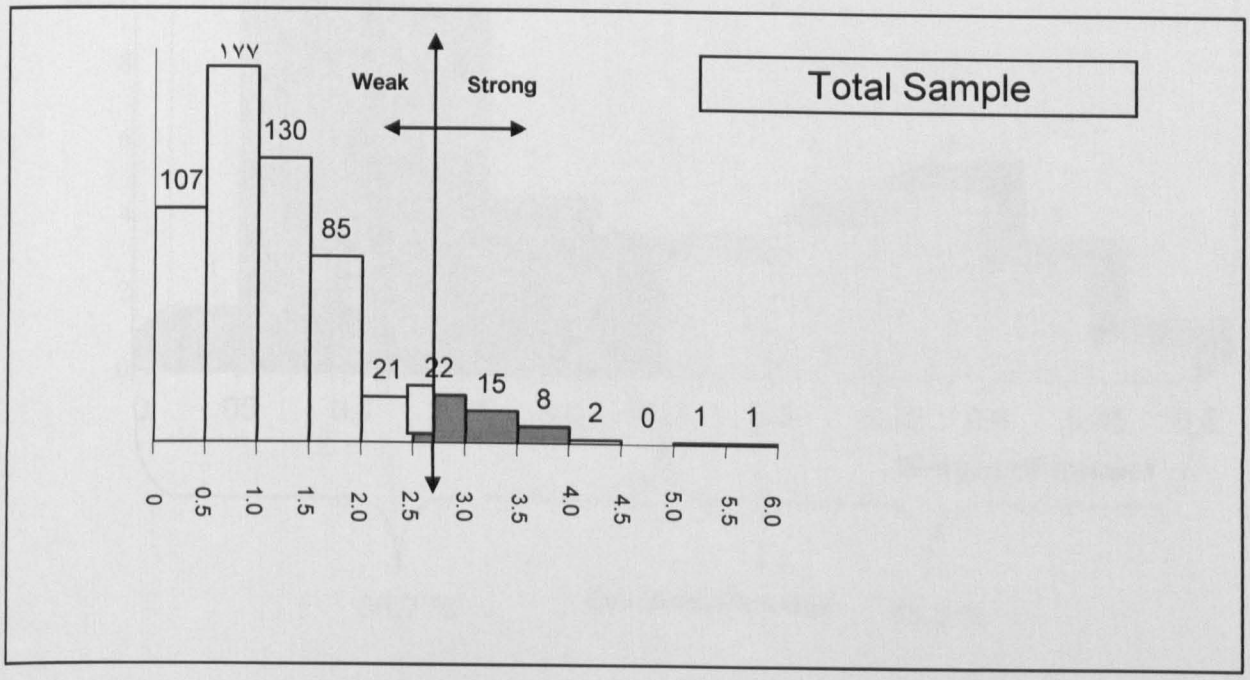



**Fig ( 74 ): Frequencies of claims impact in each cell ( Time, Money, ..... ) in Total Sample (to determine the weak / strong border line)**

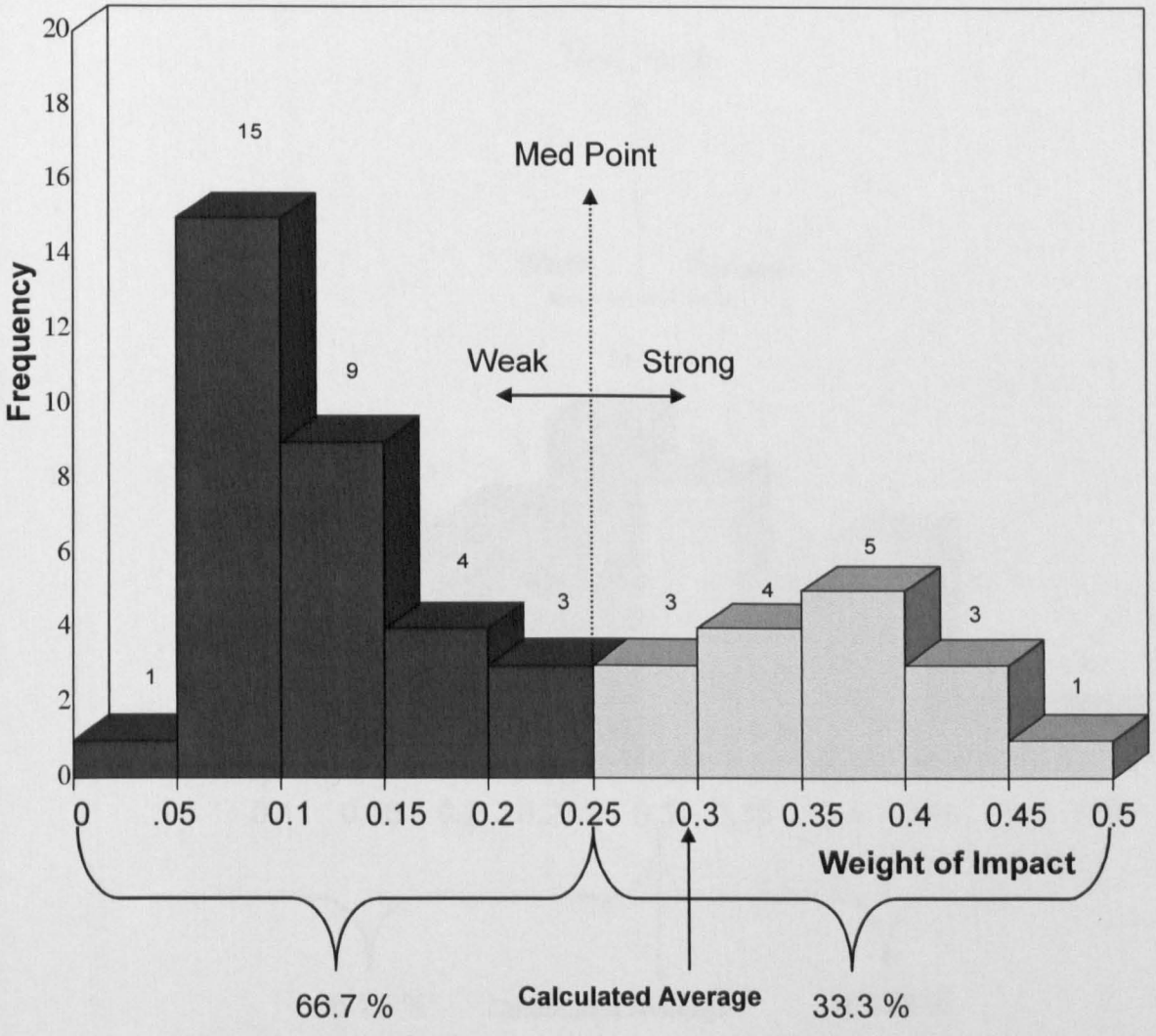



**Fig (64 ) Frequencies of Weighted Impacts of the Respondents Towards The Six Groups of Claims**

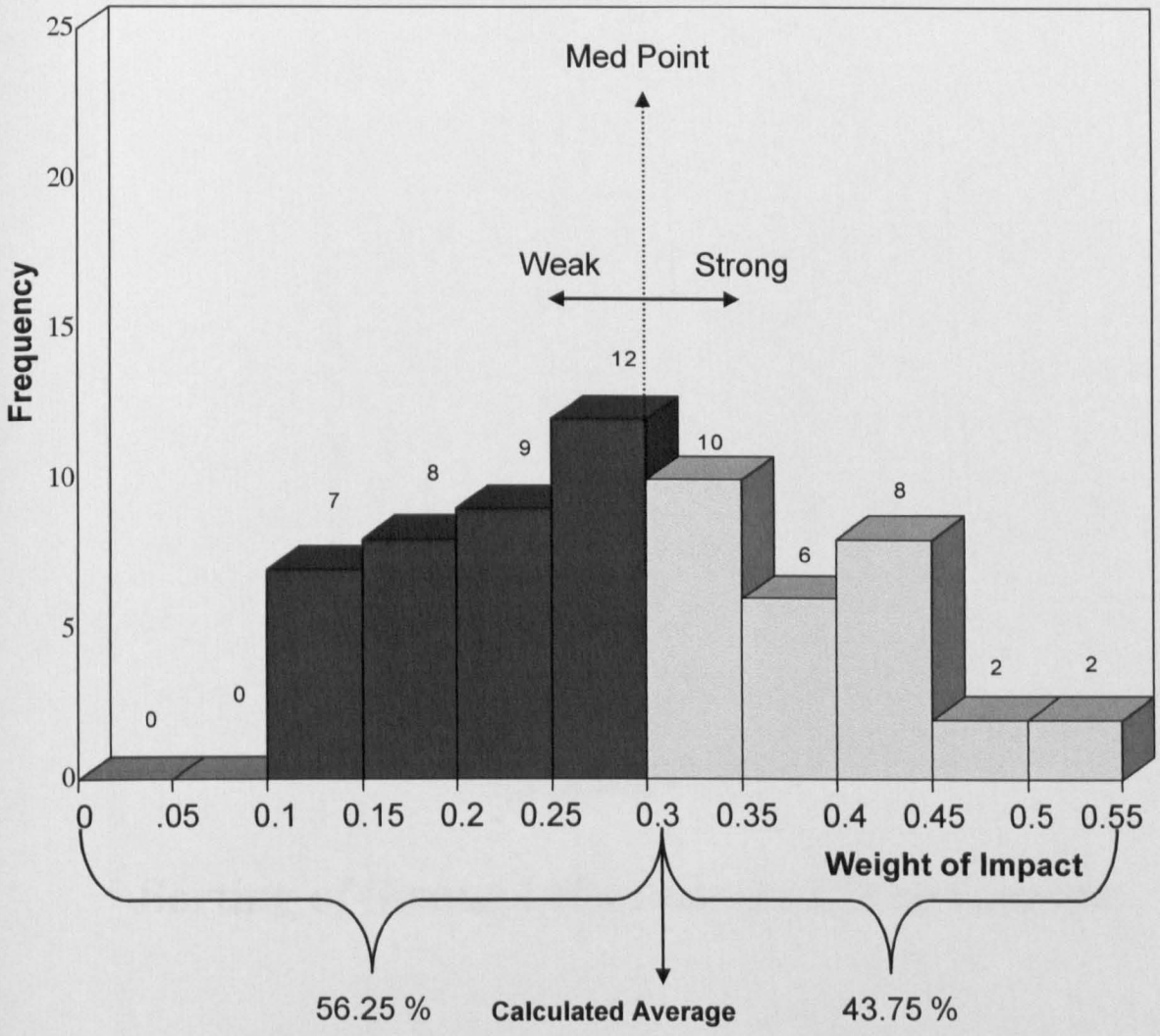



**Fig ( 65 ) Frequencies of Weighted Impacts of the Respondents Towards The Eight Variables**

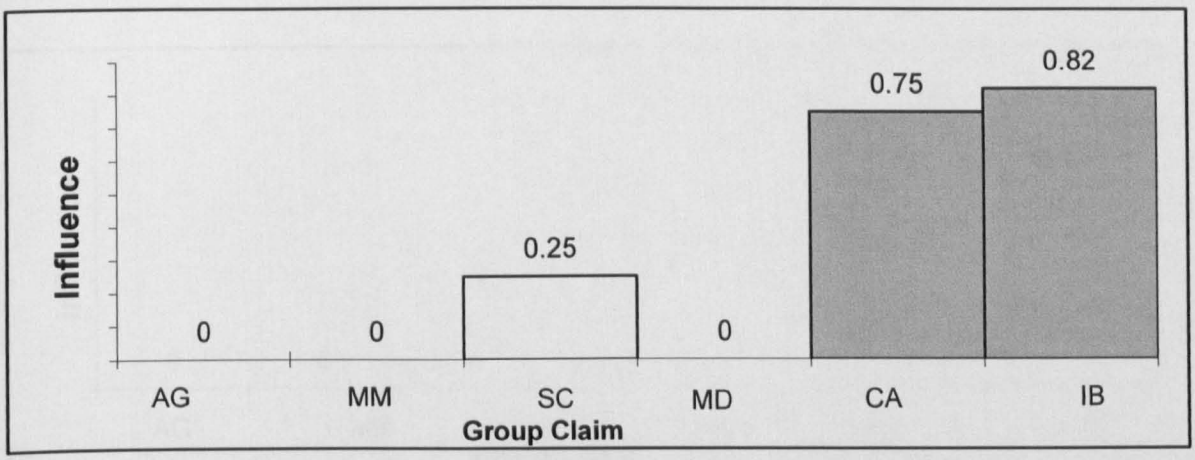
# Appendix (D)

# Sorting of Strong Influences in Claim Groups

## Fig ( 75 ): SORTING OF STRONG INFLUENCES IN CLAIM GROUPS

**(Party to project)**

**Owners**




Average = ( 0 +0.82 ) / 2 =0.41

whatever is over 0.41 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

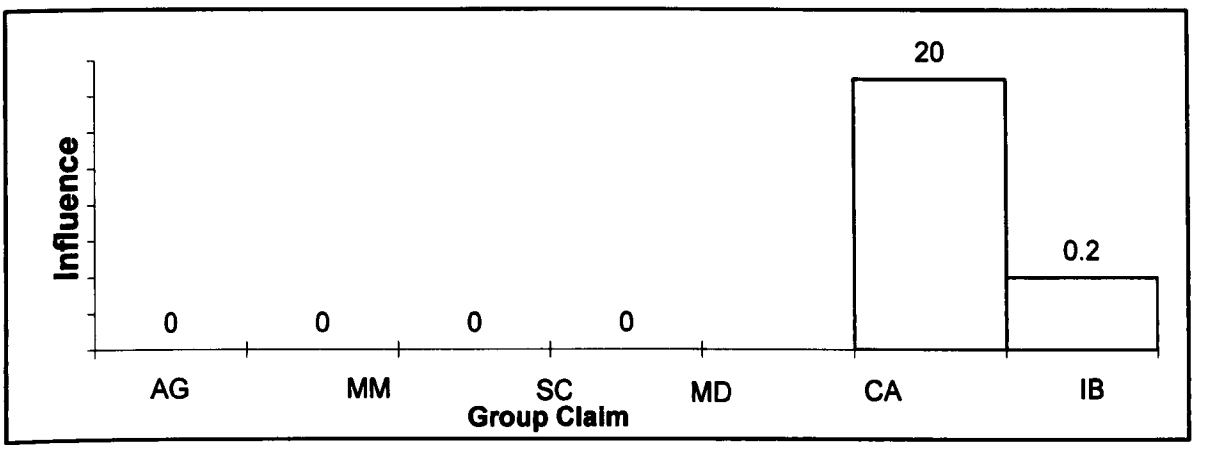
* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

## Fig ( 76 ): SORTING OF STRONG INFLUENCES IN CLAIM GROUPS

**(Party to project)**

**Contractors**




Average = ( 0 + 0.75 ) / 2 = 0.375

whatever is over 0.375 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

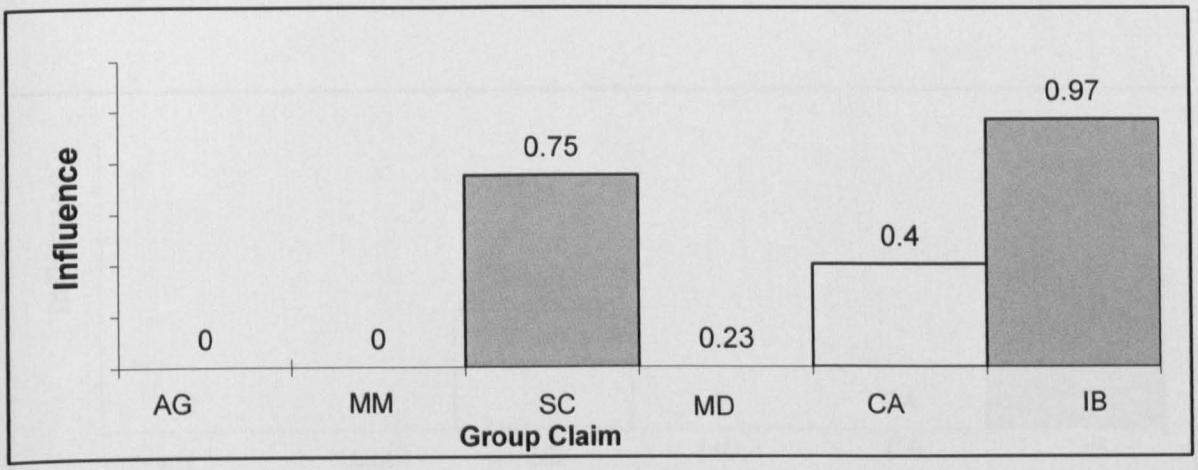
* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

**Fig ( 77 ): SORTING OF STRONG INFLUENCES IN CLAIM GROUPS**

**(Party to project)**

**Consultants**




Average = ( 0 +0.97 ) / 2 =0.485

whatever is over 0.485 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

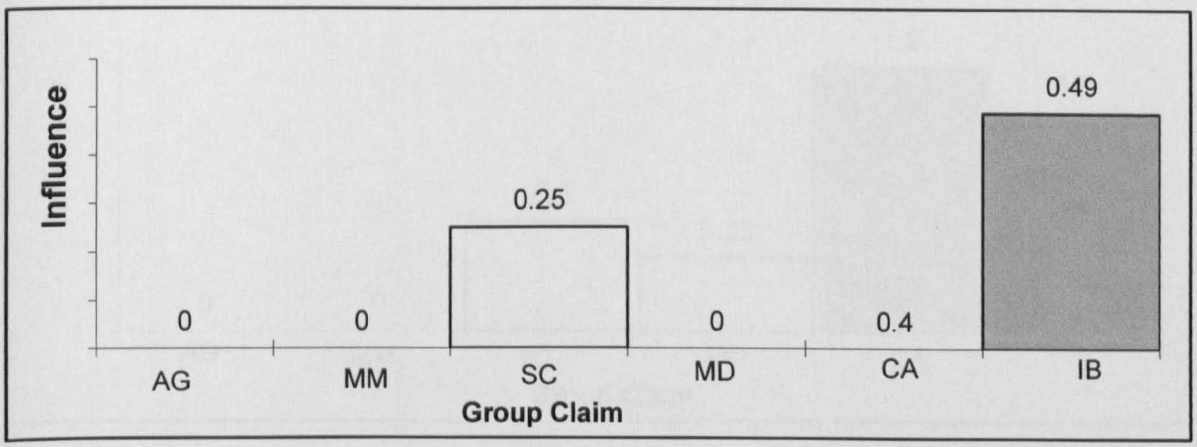
* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

## Fig ( 78 ): SORTING OF STRONG INFLUENCES IN CLAIM GROUPS

**(Ownership of projects)**

**Government Projects**




Average = ( 0 + 0.44 ) / 2 = 0.245

whatever is over 0.245 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

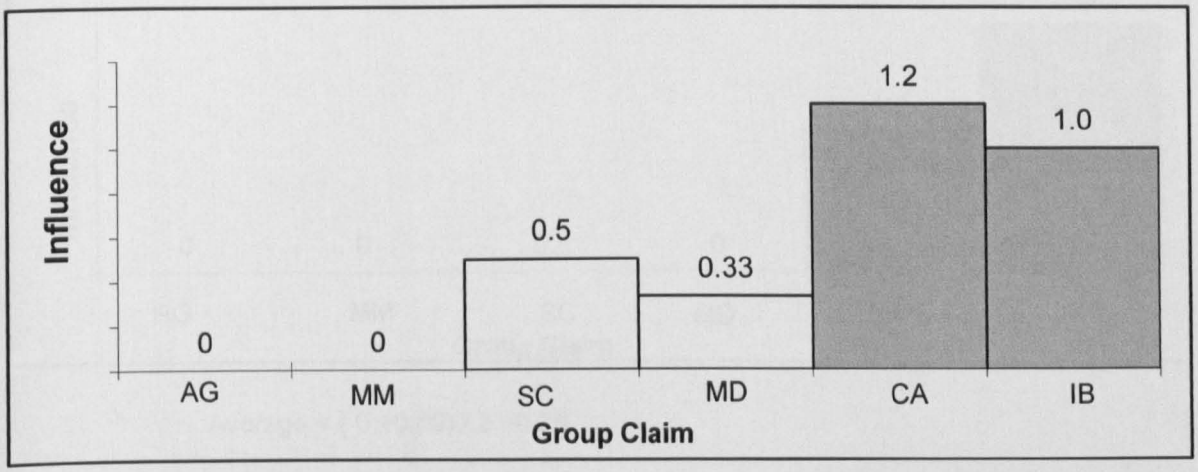
* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

## Fig ( 79 ): SORTING OF STRONG INFLUENCES IN CLAIM GROUPS

**(Ownership of projects)**

**Private projects**




Average = ( 0 + 1.2 ) / 2 = 0.6

whatever is over 0.6 is a strong influence

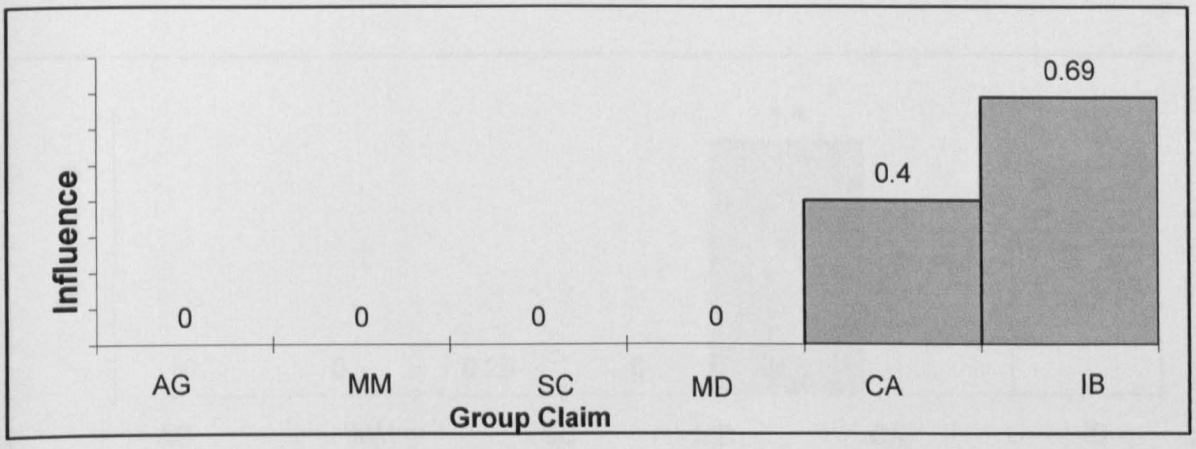
* Number of strong impacts divided by number of questions in each claim group

* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

**Fig ( 80 ):** **SORTING OF STRONG INFLUENCES IN CLAIM GROUPS**

**Size of project**
**Small (Under 5 Million)**




Average = ( 0 +0.69) / 2 =0.35

whatever is over 0.355 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

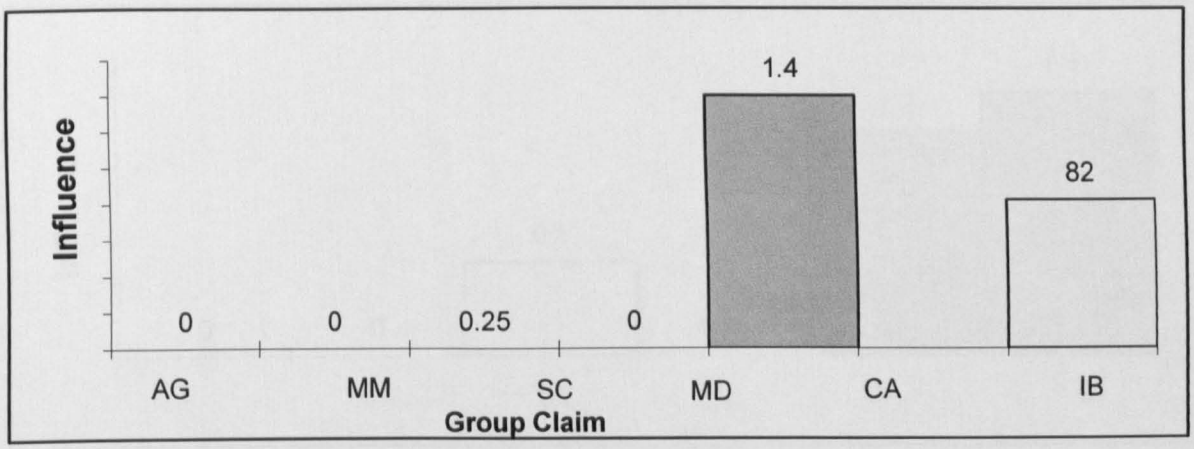
* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

**Fig ( 81 ):** **SORTING OF STRONG INFLUENCES IN CLAIM GROUPS**

**Size of projects**

**Medium (From 5 To 20 Million)**




Average = ( 0 +1.4 ) / 2 =0.7

whatever is over 0.7 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

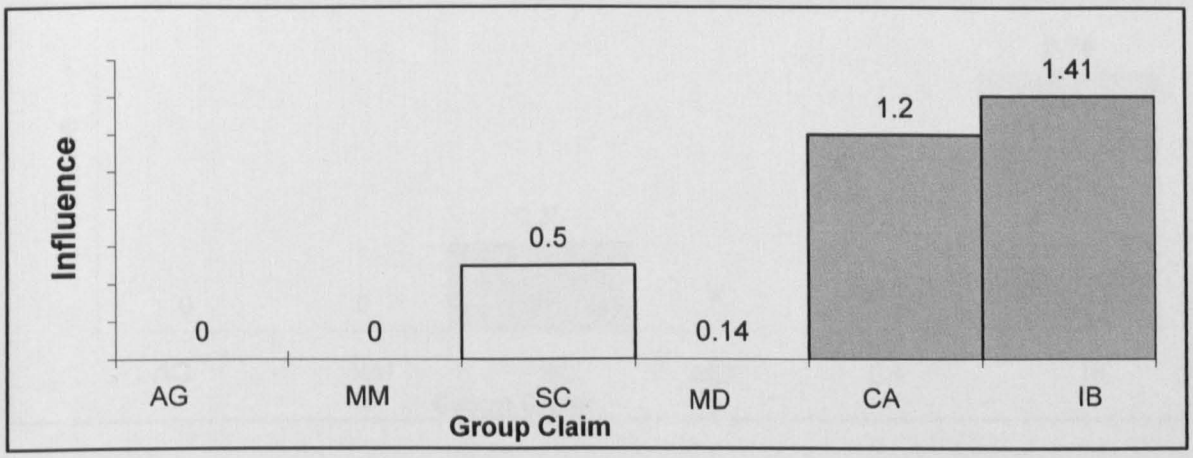
* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

Fig ( 82 ): **SORTING OF STRONG INFLUENCES IN CLAIM GROUPS**

**Size of projects**

**Large (Over 20 Million)**




Average = ( 0 +1.41 ) / 2 = 0.7

whatever is over 0.7 is a strong influence

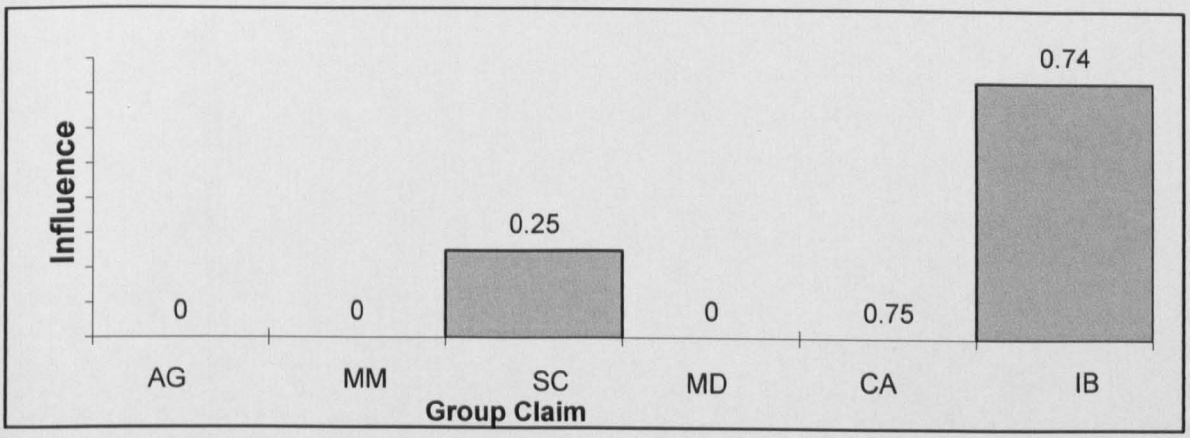
* Number of strong impacts divided by number of questions in each claim group

* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based

## Fig ( 83 ): SORTING OF STRONG INFLUENCES IN CLAIM GROUPS

**Total Sample**




Average = ( 0 +0.75 ) / 2 =0.375

whatever is over 0.375 is a strong influence

* Number of strong impacts divided by number of questions in each claim group

* Shaded areas indicate strong influence on the claim group

**AG:** Acts of God
**MM:** Man Made
**SC:** Site conditions
**MD:** Market driven
**CA:** Contract administration
**IB:** Information-based