

INVESTIGATING THE CONTRACTOR'S RISK SOURCES ASSOCIATED WITH THE PRINCIPAL BUILDING AGREEMENT IN SOUTH AFRICA

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ABSTRACT

Purpose of this paper - This paper aims to identify and quantify the risk sources to the contractor when using the Joint Building Contract Committee Principal Building Agreement Series 2000 JBCC (PBA).

Methodology/Scope - In order to achieve the above aim, a research methodology is designed to accomplish three objectives. Firstly, literature review was used to investigate the Joint Building Contracts Committee, fundamental concepts of contracts, parties of the building contract, obligations of the employer and the contractor as well as the principals of risk in construction projects. Secondly, developing the correlation matrix that establishes the relationship between the JBCC (PBA) clauses and project stakeholders. Finally, survey questionnaires and interviews were used to identify and quantify the contractor's risk sources associated with the JBCC (PBA). Quantitative and qualitative approaches were adopted for analyzing collected data.

Findings - Establishing a correlation matrix between the project stakeholders and the different clauses of the JBCC (PBA) to identify the sources of risk that confront the contractor when using the JBCC (PBA). Quantifying the contractor's risk sources in order to enable construction companies' pay more attention when dealing with these stakeholders in future projects.

Practical implications - The identification and quantification of the contractor's risk sources associated with the clauses of the JBCC (PBA) will enable the contractor consider the roles of project stakeholders when developing the risk management plan.

Value - In depth literature review showed that the research work presented in this paper and the developed correlation matrix is original and was not done before in the South African Context.

Keywords: Identifying and Quantifying Contractor's Risk Sources, Project stakeholders, Correlation Matrix, Principal Building Agreement.

1 INTRODUCTION

The construction process is governed by complicated contracts and involving complex relationships in several tiers (Abdou, 1996). There are many risks involved in construction projects. These risks could be attributed to a number of reasons. Amongst them the nature of the construction process, the complexity and time-consuming design and construction activities, the involvement of a multitude of people, from different organisations, with different skills and interests. Hence, a great deal of effort is required to co-ordinate the wide range of activities that are undertaken (Chapman and Ward, 1997; Shen, 1999). The building contract is an agreement between two parties, one of whom, the building contractor, agrees to erect a building, and the other, the employer, agrees to pay for it. Personal rights and obligations are created by the agreement, and the right of one party is the obligation of the other. A contract comes into existence on the acceptance of an offer. There is a meeting of minds, a consensus that is an essential element of a contract (Finsen, 1999). Contractual

documents are tools for managing risks (Uff, 1981). Flanagan and Norman (1993) state that the purpose of the contract is to establish the rights, duties, obligations, and responsibilities of the various contracting parties in order to allocate risk. A building contract is a trade-off between the contractor's price for undertaking the work and his willingness to accept both controllable and uncontrollable risks. Controllable risks are the ones that emerge within the contractor's organization, where uncontrollable risks are the ones which emerge outside the contractor's organization. Although the two parties of the contract are: the client and the contractor, other project stakeholders are involved in the construction process (i.e. architect, quantity surveyor and supplier). Because of the different culture, interest and organisational structure of each of them, some parties represent a risk source to other parties.

Despite the spate of studies aimed to managing risks and contracts in construction projects (for instance, Cooper and Chapman, 1987; Chapman, 1991; Flanagan and Norman, 1993; Edwards, 1995; Shen, 1999; Abdou, 1996; Ranasinghe, 1994 and 1998; Tah and Carr, 2000; Wang et al., 2000; Han et al., 2005; O'Reilly and Mawdesley, 1994) and the research focused on risks that face the client and other project stakeholders (such as Kometa et al., 1996; Kernohan et al., 1992; Fang et al., 2004) little attention has been paid to study the risk sources that confront contractors when using the JBCC (PBA) in South Africa. Smith (1998) highlighted that for years the South African building industry had a very poor reputation in managing construction risks. The research work presented in this paper is part of a successfully completed Master Degree in Construction Project Management, carried out at the School of Civil Engineering, Surveying and Construction, University of KwaZulu-Natal, South Africa, (Harinarain, 2008) aimed to investigate the risks associated with the JBCC (PBA). The purpose of this paper is to identify and quantify the contractor's risk sources associated with the JBCC (PBA) in South Africa.

2 RESEARCH METHODOLOGY AND SAMPLING

Because of the research nature that entails carrying out thorough literature review and investigating the opinion of South African contractors about the risk sources that they may confront when using the JBCC (PBA), a research methodology, consisted of literature review, questionnaires and interviews, was used to accomplish the three objectives. Firstly, literature review was used to investigate the Joint Building Contracts Committee, fundamental concepts of contracts, parties of the building contract, obligations of the employer and the contractor as well as the principles of risk in construction projects. Secondly, developing the correlation matrix that establishes the relationship between the JBCC (PBA) clauses and project stakeholders. Finally, questionnaires and interviews were conducted with selected sample of Durban based construction companies to identify and quantify the contractor's risk sources associated with the JBCC (PBA). The objective of the sampling process was to get a representative and non-biased sample to increase the validity and reliability of collected data. The Master Builder Association website (Master Builder Association, 2008) was accessed to get a list of Durban based construction companies. The result was a list of 62 companies ranging from small, medium to large enterprises. This helped get a clear and well represented sample. All these companies have been contacted telephonically to enquire if they utilise the JBCC (PBA). Out of the 62 companies contacted, 23 stated that they utilise the JBCC (PBA). These companies were contacted and the scope of the study was introduced to them. Only 9 companies agreed to participate in the study. The survey questionnaires were faxed to these companies and respondents were then interviewed to gain in depth insight and feedback. The measure of central tendency was used to get an overview of the typical value for each variable by calculating the mean, median and mode (Bernard, 2000). Analysis of the collected data showed close values of these measures which confirmed the quality and the homogeneity of the collected data. The data was analysed with the aid of Microsoft Excel spreadsheet. Since there were no quantification without qualification and no statistical analysis without interpretation (Bauer and

Gaskell, 2000) during the course of this research both approaches of quantitative and qualitative data analysis were employed.

3 OVERVIEW OF THE JBCC BUILDING AGREEMENTS

In 1984 the Joint Building Contracts Committee (JBCC) was established, to draft an agreement for the construction industry. In 1991 the committee published the JBCC Principal Building Agreement (PBA) and associated documents. In 1998 the contract was re-examined and re-drafted and a new set of documents, designated JBCC Series 2000, were published (Finsen, 1999). The JBCC is a committee which represents the variety of interests in the South African construction industry. It has six constituent member organisations which are: the Association of South African Quantity Surveyors; the Institute of South African Architects; the South African Association of Consulting Engineers; the South African Property Owners' Association; the Specialist Engineering Contractors Committee, and the Building Industries Federation of South Africa (BIFSA) (Van Deventer, 1993). The JBCC Series 2000 is a suite of documents that comprises the Principal Building Agreement, the Nominated/Selected Subcontract Agreement and the Preliminaries, which together constitute the terms and conditions of the agreement between the parties. In addition, there are sundry documents that do not add to the rights and obligations of the parties but merely facilitate the administration of the contract. These include the Contract Price Adjustment Provisions, the Construction Guarantee, the Payment Guarantee, the Payment Certificate, the Completion Certificate, etc. (Finsen, 1999).

3.1 The Principal Building Agreement

This document records the terms of the agreement between the employer and the contractor, in which the employer is represented by a principal agent, on whom nearly all of the employer's rights and obligations devolve. Other agents may be appointed to whom some of the principal agent's duties may be delegated. The document commences with a comprehensive list of definitions. The document concludes with a schedule of variables containing information specific to a particular contract.

4 FUNDAMENTAL CONCEPTS OF CONTRACTS:

The contract is an agreement by which the employer and the contractor agree about what should be done, how and when it should be done, and what should happen if it is not done. Agreement is the basis of the contract. Absence of an agreement on any fundamental aspect would be fatal to the contract and would render performance and enforcement impossible (Finsen, 1999). The followings are the fundamentals of contracts:

4.1 Contractual capacity

Anyone who has reached the age of 21 has contractual capacity, and therefore has the capacity to enter into a valid contract. Excluded are persons of unsound mind, women who are married in community of property and un-rehabilitated insolvents. A juristic person, such as a company or close corporation can enter into a contract but the act is performed by a natural person duly authorised acting on its behalf (Murdoch, 1996; Flanagan and Norman, 1993; Uff, 1981).

4.2 Variation of the terms of the contract

Just as a contract comes about by the consent of the parties, so by consent they can bring it to an end, or vary any aspect of the agreement (Murdoch, 1996; Flanagan and Norman, 1993; Uff, 1981).

4.3 The lawful termination of contracts

The contract can be brought to an end by mutual agreement. The most natural way in which a contract may come to an end is by the performance by each party of all his obligations under the contract. When each party still has obligations to discharge, a contract will terminate when the

parties mutually agree to bring it to an end. A contract may also come to an end when one of the parties, who no longer wishes to perform his obligations and enjoy his benefits under the contract, finds someone else to step into his shoes who will take over both his rights and obligations. Where this happens, the original contract terminates and a new contract arises, but all the original terms persist unless otherwise decided by the parties (Murdoch, 1996; Flanagan and Norman, 1993; Uff, 1981).

4.4 Breach of contract

Contracts impose various obligations on the parties. If one of the parties does not carry out any particular obligation, he or she is said to be in breach of contract. The remedies available to the innocent party prejudiced by such breach may be cancellation of the contract and a claim for damages, or he or she may elect to uphold the contract and claim specific performance together with damages (Murdoch, 1996; Flanagan and Norman, 1993; Uff, 1981).

4.5 Penalties and damages

Time is frequently stated in the tender documents as being the essence of the contract. If the building is completed later than the contracted completion date, the employer will have lost the use of it for a while. An employer who suffers financial loss as a consequence of late completion of the works is entitled to the usual contractual remedy of damages (Murdoch, 1996; Flanagan and Norman, 1993; Uff, 1981).

4.6 Extensions of time

Most building contracts contain express provisions under which the period allowed for the contractor to undertake and complete the works can be extended. The importance of losing the fixed date is that a contractor who has caused part of the delay is still liable to pay general damages for delay (Murdoch, 1996; Flanagan and Norman, 1993; Uff, 1981).

4.7 Dispute-resolution

All parties to a building contract will start off with the best intentions to get the work both completed satisfactorily in the agreed time and at the least expense to the owner. Somewhere between the beginning and the end, disagreements, disputes, disruption and delays arise which can destroy the best of intentions. The reasons for disputes are the fact that the scale of building projects has increased enormously in recent years, and their design and construction has grown in complexity. Such projects require an ever-increasing number of specialist subcontractors. The pressure has been on the construction industry to build more and more in less and less time (Murdoch, 1996; Flanagan, Norman, 1993; Uff, 1981).

5 PARTIES OF THE BUILDING CONTRACT

The parties to a building contract are, on the one hand, the person who wishes to have a building built for himself, who is generally referred to in building contracts as the employer, and, on the other hand, the builder who carries out the work, generally referred to as the contractor. Architects, quantity surveyors, engineering consultants, etc. are not parties to a contract in that they do not acquire legal rights or obligations, but they are nevertheless charged with many duties as agents of the employer and have their own contracts with the client (Finsen, 1999). Agency is a broad term describing the relationship between two parties whereby one, the agent, acts on behalf of the other, the principal. An agency may arise under a contract, whereby the agent is appointed by his principal to carry out certain duties (Uff, 1981). Figure (1) shows the parties of the building contract.

5.1 The employer

Employers may be divided into two categories: those who erect buildings for their own ownership and use, whether they intend to inhabit and use the buildings themselves or let them to others, and

those whose intention is to sell the buildings as soon as they can, possibly even during the construction phase, so that they can recoup their capital, with a profit, and embark on further building projects. This latter type of employer is generally referred to as a property developer. Most of the major employers with large ongoing building programmes are members of the South African Property Owners' Association (SAPOA) which was formed to co-ordinate their views and to provide a representative body for negotiating with other representative bodies in the building industry (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

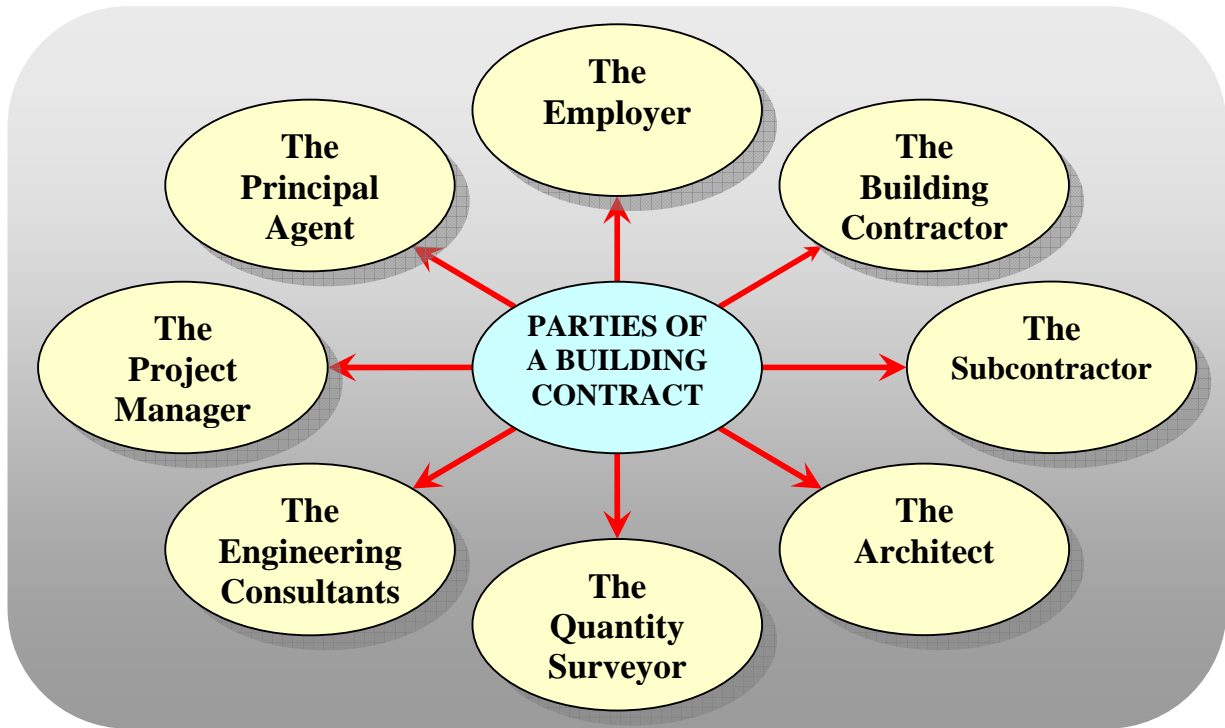


Figure (1) Parties of the building contract

5.2 The building contractor

A building contractor usually undertakes to build the entire project, moving onto a vacant site at the inception of the contract and at its completion, delivering a building that is complete in all respects and ready for occupation and use by the employer. Many building contractors are members of their local Master Builders Association, but membership of such associations is no guarantee of competence or integrity. Contractors are coordinated by the Building Industries Federation South Africa (BIFSA) which is a representative body that negotiates strongly on behalf of its constituent members. At one time building contractors employed most, if not all, of the tradesmen that might be required for any particular project. With the growing complexity of building techniques and installations, however, there has been very rapid growth of the subcontracting industry and there are now numerous subcontractors specialising in various aspects of building construction and installations (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

5.3 Subcontractor

Essentially the typical standard form subcontract is designed to achieve a mirror image of the main contractual provisions. As the trend towards subcontracting developed, employers saw the opportunity of getting the best of both worlds, and the nominated subcontract was introduced which enabled the employer to have the benefit of a principal contractor to control the entire building operation while yet being able themselves to choose specific subcontractors to undertake specific work (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

5.4 The architect

An architect is a person who designs buildings and superintends their erection. He is both advisor to, and agent of his client. Only persons registered as an architect in terms of the Architects' Act 1970 may hold themselves out as an architect. An architect is required to be familiar with all the statutory or other legal requirements or limitations on the design of his client's building and to ensure that his design complies with them (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

5.5 The quantity surveyor

The quantity surveyor is a person who calculates the quantity of labour and materials that are required to erect the building and compiles this information in a document known as a bill of quantities, which is used by tenderers as a basis for estimating the cost of the project and formulating their tenders. As an agent of the client, the quantity surveyor prepares preliminary estimates of cost, advises on the value of interim payment certificates, evaluates claims for extras and determines the proper value of the final account. In recent years the quantity surveyor's have been able to advise a client on a project's future running and maintenance costs and the income it may be expected to generate by way of rentals. During the course of the contract, he can predict the employer's cash flow in respect of monthly payments to the contractor and keep the employer continual informed on variations to the contract price caused either by cost fluctuations or changes to the design or specification. The profession of quantity surveying is governed by the South African Council for Quantity Surveyors, a statutory body established in terms of the Quantity Surveyors' Act 1970, which supervises the education of quantity surveyors, administers their registration and deals with infringements of the rules of professional conduct (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

5.6 Engineering consultants

The structural design of contemporary buildings, and the design of their mechanical and electrical installations, has become so sophisticated and complex that it is beyond the technical knowledge and experience of architects, and is therefore undertaken by engineers trained and experienced in this type of work. Like the other members of the professional team, the engineer is normally engaged by the employer of the building and is liable to his client for any negligence in the execution of his professional duties (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

5.7 The project manager

A project manager is involved in a number of highly specialised professional disciplines and activities in complex projects where there is a need for someone to co-ordinate these disciplines in order to ensure the timeous and harmonious completion of the project. The prime responsibility of project managers is to see that neither the programme nor the budget is exceeded. In so doing the project manager often becomes the principal agent in the building contract, with the responsibility for the contract administration duties that would otherwise devolve upon the architect (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

5.8 The principal agent

In the JBCC Series 2000 edition no mention is made either of the architect or of the quantity surveyor or any of the engineers. Instead there is a principal agent who assumes all these roles. He may be an architect or anyone else, even a project manager. He is not expected to fulfill all of these roles as provision is made for the employer to appoint other agents who will continue to play their traditional roles. However, it is only the principal agent who can issue instructions, receive notices on behalf of the employer and bind the employer, although he can delegate certain of his authority to the other agents. The principal agent is not a party to the contract and does not acquire any contractual rights and obligations. He acts on behalf of the employer in respect of a great number of his obligations which, for lack of training and expertise, the employer cannot perform himself. The duties of the principal agent and the other agents to the employer under a construction contract are,

first, to carry out their duties with reasonable skill and care, independently exercising reasonable professional judgment, and, secondly, to protect the employer's interests (Finsen, 1999; Murdoch, 1996; Van Deventer, 1993).

6 OBLIGATIONS OF THE EMPLOYER AND THE CONTRACTOR

6.1 Obligations of the employer under the Principal Agreement

The prime obligations of the employer under the contract are:

(1) Appoint agents

The employer surrenders many of his contractual rights to his principal agent: inter alia, the right to approve work, to order additional work, to determine the value of variations, to extend the construction, and to determine the amounts of payments to be made under an interim or final payment certificate.

(2) Hand over the site to the contractor

At the commencement of the construction period, the site is required to be 'handed over' to the contractor to enable him to carry out the contract. The contractor is put in possession of the site, but ownership of the site remains with the employer.

(3) Make payments in accordance with the agreement.

(4) Provide a payment guarantee if required.

(5) Provide drawings and instructions

The contractor has undertaken to carry out the work in accordance with the drawings and instructions issued from time to time by the principal agent.

(6) Interim payments

Most contractors do not have the financial resources to finance the construction of a project from start to finish, and it has become the invariable custom that the contractor is paid at regular intervals, usually monthly, an amount which represents the value of work done since the previous payment.

(7) Final account and final payment

The final account, which represents the contract value at the time that the contractor has finally discharged his contractual obligations, is required to be prepared by the principal agent and submitted to the contractor within 90 working days from the date of practical completion. The contractor is required to co-operate and assist in the preparation of the final account by providing all necessary documents and information that may be requested (Finsen, 1999; Edwards, 1995; Van Deventer, 1993).

6.2 Obligations of the contractor under the Principal Building Agreement

The obligations of the contractor under the Principal Building Agreement are:

(1) Submission of priced bills of quantities or lump-sum document

The bills of quantities will be used primarily for valuing variations, but also for valuing work in progress for interim payment certificates.

(2) Furnishing of security

Clause 14.0 provides for three alternative forms of security for the due performance of the contract to be furnished by the contractor, and the choice rests with the contractor, who is required to indicate his choice in his tender. In the event that the contractor fails to provide a security, the employer may either accept the default form of security provided or cancel the agreement.

(3) Furnishing waiver of lien. Where the contractor is required to waive his lien, he shall do so, using the JBCC Waiver of Contractor's Lien form, within seven calendar days of receiving a payment guarantee from the employer.

(4) Appoint a site representative

Clause 6.0 requires the contractor to have on site at all times a competent representative to administer and control the works.

(5) Prepare a construction programme

The common-law position is that the contractor, having contracted to carry out certain work within an agreed time, is free to carry it out in whatever manner he wishes.

(6) Carry out and complete the work by the agreed date

The contractor's first and most obvious obligation is to carry out the agreed work, and to do so by the agreed date. Failure to complete the works by the agreed date renders him liable to penalties for non-completion

(7) Materials and workmanship to be satisfactory

The contractor is deemed to be an expert in building, and is expected to ensure that the materials that he acquires for the works are not defective.

(8) Contractor's obligations to subcontractors

The contractor stands in the same relationship to a subcontractor under a Subcontract Agreement as the employer does to him under the Principal Agreement, to give the subcontractor access to the portion of works necessary for the execution of the subcontract, to make payments, to furnish a payment guarantee, and to provide drawings and instructions.

(9) Limitation to liability for latent defects

The contractor's obligation is to complete the works free of patent defects. Latent defects may become apparent some time after final completion, and if they were due to some breach of the contract, the contractor would be liable for their rectification. In the JBCC Agreements, as a matter of policy, the contractor's liability for latent defects is contractually limited to five years.

(10) Liability for design

Where the design is prepared by an architect or engineer, the contractor's contractual obligation is to build in strict accordance with that design, and any deviation from it would amount to breach of contract.

(11) Suspension of the works

The contractor is not entitled to suspend the works for any reason whatsoever.

(12) Contract instructions

The employer, has the unilateral right to vary the extent and nature of the performance to be rendered by the other party. The other party, the contractor, cannot refuse to carry out the varied obligation, and his only remedies are an adjustment of the price he is entitled to be paid for the performance, and, in appropriate circumstances, an extension of the time in which to make such performance (Finsen, 1999; Edwards, 1995; Van Deventer, 1993).

7 THE PRINCIPALS OF RISK IN CONSTRUCTION PROJECTS

Construction projects can best be understood in the context of the whole industry. Technological complexity ranges from the familiar, well-known materials and trades through to highly complex facilities involving multiple interacting sub-systems. Regardless of its technological complexity, any reasonably sized project involves a high level of organisational complexity. This arises because there are many specialised skills and professions with a useful contribution to the process (Murdoch, 1996). The fundamental risks inherent in any construction project are apportioned between the client, the design team, the general contractor, the specialist contractors, and the material and component suppliers within the various contractual relationships (Flanagan and Norman, 1993). The construction industry is fundamentally a people industry where the project is designed by people, built by people and in the majority of cases built to accommodate people (Sawczuk, 1996). Some of the biggest risks taken by contractors are at tender stage when they commit to a price and programme. Many companies now consider risk management to be an essential part of the tendering process (Finsen, 1999). Risk management is concerned with identifying the salient risks, assessing their likelihood and deciding how best to manage the project efficiently in the light of this information. In entering into a contract, parties face a choice about how to deal with the risks inherent in the venture. The emphasis should be on the process of

identifying the nature of the particular risks for a construction project and deciding where these risks should lie within the project team. Different types of building contract will allocate risks in different quarters. In allocating a risk, construction professionals are concerned with the eventual payment and responsibility for the cost of the event, should it eventuate. The main point about contractual risks is that the contract apportions these between the parties. Even if the contract is silent on a particular risk, that risk will still lie with one party or the other. The contract may seek to transfer a risk by making one party financially liable should the eventuality take place. In this way, risks are translated into financial equivalents so that they may be transferred or otherwise dealt with (Murdoch, 1996).

8 IDENTIFICATION OF CONTRACTOR'S RISK SOURCES ASSOCIATED WITH THE PRINCIPAL BUILDING AGREEMENT

Risk is defined as any unexpected events that may occur during the process of building procurement, and can cause losses to the client or other interested parties (Shen, 1999). Based on the above definition and the criteria of identifying risks associated with the JBCC (PBA) developed by (Harinarain and Othman, 2007) risk sources to the contractor could be defined as the person, authority or event that either reduce the strength of the company, increase its weakness, reduce its opportunities and increase its threats, which eventually affects the achievement of the project objectives and client satisfaction. In this research, survey questionnaires and interviews were utilized to identify and quantify the contractor's risk sources associated with the JBCC (PBA). Respondents to the questionnaire and interviewees were asked to select the risk source from a list of project stakeholders. They were (1) client, (2) principal agent, (3) architect, (4) quantity surveyor, (5) engineer, (6) supplier, (7) sub-contractor and (8) government authority. The outcome of the questionnaires and the interviews is described below.

The Client as a Source Risk to the Contractor

Data analysis showed that clients are the risk source to the contractor in 72.5% of the JBCC (PBA) clauses. All respondents stated that the client is the main risk source to the contractor in clauses 3,9,10,11,12,19,31,37,38 & 39. The client represents an immense risk source because he makes the decision to build, specify the design requirements, states the ultimate budget, commencement and completion dates and if there are to be any variations. Clients are risk sources to the contractor with varying degrees with regard to other clauses, see table (1).



The Principal Agent as a Source Risk to the Contractor

Analysis of responses showed that principal agent represents the risk source to the contractor in 25% of the JBCC (PBA) clauses with varying degrees. Lack of the leadership and experience of the principal agent to issue instructions to project teams, receive notices on behalf of the employer or represent him may cause many decisions to be suspended which in turn affect the daily work of the project and affect the contractor progress.



The Architect as a Source Risk to the Contractor

Data analysis showed that architects are the risk source to the contractor in 25% of the JBCC (PBA) clauses with varying degrees. Design errors, uncoordinated tender documents, design changes due to (for instance, incomplete project brief, lack of understanding client requirements, lack of design experience) are risks the contractor confront during the construction process.



The Quantity Surveyor as a Source Risk to the Contractor

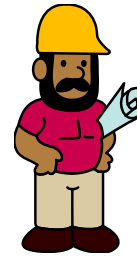
Respondents mentioned that quantity surveyors are the risk source to the contractor in 32.5% of the JBCC (PBA) clauses. 50% of the respondents mentioned that incorrect and late completion of the contract account (clauses 33 and 34) delays the



contractor's cash flow and hinder him from starting new projects. Other risks that the quantity surveyors can cause to the contractor are adjustment to the contract value, delaying payment and dispute settlement, see table (1).

The Engineer as a Source Risk to the Contractor

Respondents mentioned that in 10 out of 40 clauses of the JBCC (PBA) the engineer is considered the risk source to the contractor. Complexity of building design, lack of expertise, design error, missing information, uncoordinated documents and resolving disputes represent risk sources to the contractor. Engineers are risk sources to contractors with varying degrees in other clauses, see table (1).



The Supplier as a Source Risk to the Contractor

In 3 out of 40 clauses of the JBCC (PBA) suppliers represent risk to the contractors. Lack of access of the supplier to the work, revising the completion date and dispute settlement will hinder the supplier from delivering requirements materials and equipment on time which delays the contractor and prevents him from meeting the project requirements.



The Sub-contractor as a Source Risk to the Contractor

In 37.5% of the JBCC (PBA) clauses, sub-contractors represent the risk sources to the contractor. 22.2% of the respondents stated that in clause 21 and 23, sub-contractors were the main source of risk to contractor. This is because any delay caused by the subcontractor due to incompleteness of his job will hinder the contractor to meet the project deadline and could cause penalties and client dissatisfaction. Sub-contractors are risk sources to contractors with varying degrees in other clauses, see table (1).



The Government Authority as a Source Risk to the Contractor

In 12.5% of the JBCC (PBA) clauses, Government authorities represent the risk sources to the contractor. 83% of the respondents stated that changing government regulations during the construction process is considered a risk that affects the contractor's progress on site. Government authorities are risk sources to contractors with varying degrees in other clauses, see table (1).



It worth to mention that 21% of the clauses are not applicable because they either do not contain any words or they are explaining various aspects of the contract.

9 QUANTIFICATION OF CONTRACTOR'S RISK SOURCES ASSOCIATED WITH THE PRINCIPAL BUILDING AGREEMENT

Data analysis showed that clients are ranked the highest risk source that faces contractors when using the JBCC (PBA) with (mean 4.8, median 4.7 and mode 4.8 out of 5). Sub-contractors were ranked the second risk source to the contractor with (mean 4.5, median 4.4 and mode of 4.3 out of 5). Suppliers were ranked the least risk source to the contractor with (mean of 2.7, median 2.6 and mode 2.5 out of 5). Figure (2) and Table (2) show the quantification of the contractor's risk sources.

10 CONCLUSIONS AND RECOMMENDATIONS

Construction is high-risk venture. Each project is unique and has its own specific design to be constructed on a particular site within a definite timeframe, cost, materials, equipment and labour. Successful construction requires flawless functioning of the project stakeholders comprising the client, the design team, the construction team, and various trades, manufacturers, suppliers in a professional and timely manner. In spite of the client and the contractor as the contract parties, other project players are involved in the construction process. Due to the different culture, interest and organisational structure of each of them, some parties represent a risk source to other parties. This paper identified the contractor's risk sources associated with the JBCC (PBA) in South Africa.

Results of the study showed that the risk sources to the contractors ranked from the highest to the least order are: client, sub-contractor, quantity surveyor, principal agent, architect, engineer, government authorities and supplier. Contractors have to consider the effect of each risk source when developing their risk management plan.

Clauses	Sources of Risk to the Contractor								
	Client	Principal Agent	Architect	Quantity Surveyor	Engineer	Supplier	Sub-contractor	Government Authority	
3.0	DOCUMENTS	100%							
9.0	INDEMNITIES	100%							
10.0	WORKS INSURANCES	100%							
11.0	LIABILITY INSURANCES	100%							
12.0	EFFECTING INSURANCES	100%							
19.0	ASSIGNMENT	100%							
31.0	INTERIM PAYMENT	100%							
37.0	CANCELLATION BY EMPLOYER. LOSS AND DAMAGE	100%							
38.0	CANCELLATION BY CONTRACTOR - EMPLOYER'S DEFAULT	100%							
39.0	CANCELLATION-CESSATION OF WORKS	100%							
21.0	SELECTED SUBCONTRACTORS						100%		
23.0	DOMESTIC SUBCONTRACTORS						100%		
22.0	DIRECT CONTRACTORS	67%					33%		
27.0	LATENT DEFECTS	67%					33%		
20.0	NOMINATED SUBCONTRACTORS	50%					50%		
33.0	RECOVERY OF EXPENSE AND LOSS	50%			50%				
34.0	FINAL ACCOUNT AND FINAL PAYMENT	50%			50%				
7.0	REGULATIONS	17%							83%
32.0	ADJUSTMENT TO THE CONTRACT VALUE	44.44%		11.11%	44.44%				
15.0	WORKS EXECUTION	44.44%			44.44%			11.11%	
35.0	PAYMENT TO OTHER PARTIES	33%	17%		33%		17%		
18.0	SETTING OUT OF THE WORKS	33%				50%			17%
4.0	DESIGN RESPONSIBILITY	8%	8%	42%		42%			
17.0	CONTRACT INSTRUCTIONS	18.89%	18.89%	18.89%	18.89%	18.89%		5.56%	
5.0	EMPLOYER'S AGENTS	17.78%	17.78%	17.78%	17.78%	17.78%		11.11%	
24.0	PRACTICAL COMPLETION	17.78%	17.78%	17.78%	17.78%	17.78%		17.78%	
25.0	WORKS COMPLETION	17.78%	17.78%	17.78%	11.11%	17.78%		17.78%	
26.0	FINAL COMPLETION	17.78%	17.78%	17.78%	11.11%	17.78%		17.78%	
16.0	ACCESS TO THE WORKS	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%
29.0	REVISION OF DATE FOR PRACTICAL COMPLETION	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%
40.0	DISPUTE SETTLEMENT	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%
1.0	DEFINITIONS					N/A			
2.0	OFFER ACCEPTANCE AND PERFORMANCE					N/A			
6.0	SITE REPRESENTATIVE					N/A			
8.0	WORKS RISK					N/A			
13.0	NO CLAUSE					N/A			
14.0	SECURITY					N/A			
30.0	PENALTY					N/A			
36.0	CANCELLATION - CONTRACTOR'S DEFAULT					N/A			

Table (1) Correlation Matrix of Risk Sources to the contractor

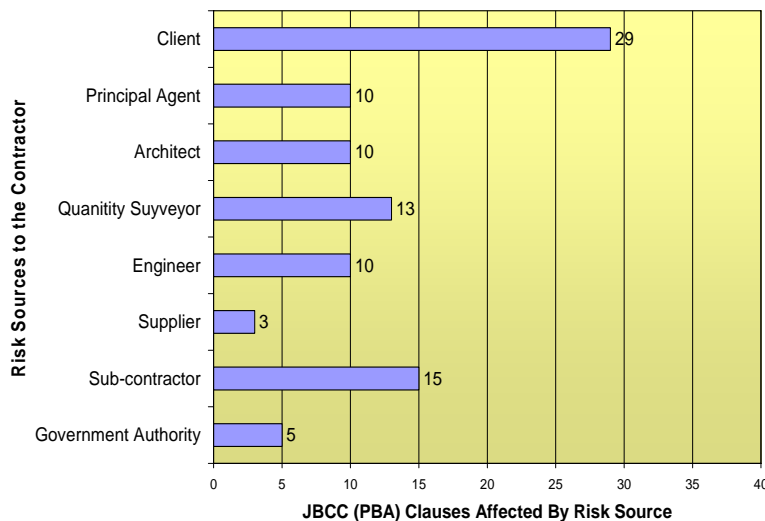


Figure (2) Risk sources to contractor using the JBCC (PBA)

Project Stakeholder	Mean	Median	Mode
Client	4.8	4.7	4.8
Sub-contractor	4.5	4.4	4.3
Quantity Surveyor	4.3	4.2	4.2
Principal Agent	4	3.9	3.8
Architect	3.7	3.4	3.5
Engineer	3.2	3.2	3
Government Authorities	2.9	2.8	2.8
Supplier	2.7	2.6	2.5

Table (2) the central tendency measures of the risk sources to the contractor

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