THE MANAGEMENT OF RISKS IN THE PROCUREMENT OF VERY LARGE CONSTRUCTION PROJECTS

(BRITAIN AND NEW COMMONWEALTH)

COMPARATIVE CHANGE IN PROCUREMENT METHODS FOR
VERY LARGE CONSTRUCTION PROJECTS

BY

AUDREY DJANG HESSE

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Building Economics and Management

Supervised by G. IVE

Bartlett School of Architecture and Planning
University College

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OUTLINE

Risk analysis is far more than an investment calculation. Simply put, risk analysis is a systematic study of the possible risks and consequences to the project or an analyses of the probability of success or failure and the consequences that may follow.

Identification and measurement of risks must be an included element of pre-planning management. As there are so many risks whose consequences can occur in a nearly infinite number of combinations it is poor planning to decide on the implementation of major projects without a proper assessment of possible risks. While every risk carries with it the potential for a loss, this loss is not assured and there may be a potential for gain. Thus, risk containment efforts must be directed toward preventing losses and taking advantage of any gain potential.

To achieve success in the procurement of large construction projects, it is necessary to look beyond the confines of the forms of contract and to carry out a structured evaluation of the whole project.

Though risk management is important to the development of large projects worldwide, it is very crucial in the LDC's, where the consequences of projects exceeding time and cost constraints and being completed far below the expected standards can have far reaching ramifications nationwide.

An example of risk management is given in the appendix.

KEY WORDS/CLAUSES

Risk identification; risk analysis; risk evaluation; risk allocation; risk management.

INTRODUCTION

The 1960's signalled an era of great optimism, with several newly independent countries all with high hopes of developing their economies in terms of infrastructure and services. Their optimism was matched by the colonial powers such as Britain who maintained strong ties both socially and economically.
On this wave of optimism, development plans were structured aiming at high levels of economic growth and large projects were initiated and commissioned. The projects were financed by the large international banks such as the World Bank (International Bank for Reconstruction and Development), and by banks such as the African Development Bank (ADB), by the British Overseas Development Agency, and through joint finance agreements between the recipient country and an industrialised country.
By the beginning of the 1980's, there had been a definite cooling of the expectations of all concerned with development in the LDC's. The optimism that had fuelled the development plans had been dampened considerably - the LDC's had been racked by socio-economic and political problems and the economic programmes had not met forecasted levels. Quite a number of large construction projects had seriously overrun their budget and time estimates with dire repercussions for the countries concerned.
This has led to a re-organisation and re-planning of construction contracts mainly instigated by the funding agencies and the governments of the LDC's, with a more realistic assessment of the economic situation of the countries concerned.

In Britain, there has also been a change in the procurement methods of large projects due to client and financier dissatisfaction with projects that do not meet their time, cost and quality expectations. This has led to a distinct difference of policy between procurement methods prevailing in the 1960's and procurement methods which are currently used today.

The large amounts of capital lent by the large banks that is put into any large construction project both in Britain and in the LDC's means that projects that overrun their budget estimate and contract period as well as falling short of their quality standards is viewed as a very serious problem. This common problem occurring in the LDC's has very serious repercussions economically, socially and even politically.
Over the last thirty years, there has been a change of policy by the funding agencies towards the procurement and management of construction projects that are financed by them: the banks to ensure that there is profitable returns on the capital employed, and the Overseas Development Agency to ensure that there are social and economic costs to the recipients of their grants.

Not all large construction projects were a disaster, some are actually finished within their time, cost and quality specifications, and with social and economic gain to their recipients. It is the view of this writer that the successful projects were well managed in terms of identification and allocation of risks and that the various parties to the construction contract performed according to the risks that were allocated to them. This is also the case with large projects in Britain, with different forms of contract used to allocate risks to the parties engaged in the contract.

This research will identify the concept of risks in construction projects and offer proposals to be included in managing construction contracts for large projects. (See page 41 in appendix)

CHAPTER 1

This section explores what various authorities have written on the subject of risk and uncertainties in general, and also within the construction industry.

1.1 LITERATURE REVIEW

The Collins Concise English Dictionary defines risk as 'the possibility of incurring a misfortune or loss.'
Uncertainty is defined as 'the state or condition of not being able to accurately know or predict an uncertain matter or a contingency.'

The Construction Industry Institute of the University of Texas' paper 'Management of Project Risks and Uncertainties' (1988), observes that 'in addition to death and taxes, uncertainty is the third factor that is sure in life.' Human or business life is subject to uncertainties, many of which involve risks which continually challenge it. Risks threaten both physical and economic well-being... And for a life to survive and prosper, it must continually face and manage these uncertainties. Uncertainties that have only a loss potential tend to command most of our attention. Yet some uncertainties have the potential for gain. For example, we know that investing in the stock market has the potential for gins as well as loss. Management of uncertainty must consider the potential in both directions.

This view of the inevitability of uncertainty in business activity is further expanded in the Encyclopedia Britannica which says within the topic of 'Economic Theory': ... In the real world, which is not static and where competition does not conform to the theoretical assumptions, profit may be explained by five causes, one of which is uncertainty. An essential characteristic of business enterprise is that not all future developments can be foreseen or insured against.

Knight, F. (1921) introduced the distinction between risk, which can be insured for and thus treated as a regular cost of production; and uncertainty , which cannot. In a free enterprise economy, the willingness to cope with the uninsurable has to renumerated, and thus is a factor of production.

The significance of efficient management of risk and uncertainty within the construction industry, is put forward by Kangari, R. and Farid, F. (1988) who say that the construction industry is a risky industry compared to the overall economy. Management deals with the ever increasing uncertainties generated by the dynamic world of construction. Uncertainty factors, due to external and internal forces continuously influence construction processes and consequently affect the outcomes such as profit, cost or duration of the project.

The Tavistock Institute's 'Interdependence and Uncertainty study (1966) found out that the essence of interdependence in the building process (the relevance of different streams of information to each other in particular contexts) leads to uncertainties arising within the building process in addition to uncertainties that arise from outside the building process. Uncertainties that arise from within the building process are as a result of the interdependence of decisions between the various design consultants. Uncertainties that arise from outside the building process are from two sources: first, there are the uncertainties engendered by the action of those not directly involved in the building process, such as government departments, planning authorities, public bodies, client organization, and even the general public; secondly, there are the uncertainties which stem from resources - labour, equipment and materials.

Chapman, C.B. and Ward, S.C.(1989) reiterate that developing and executing a project can be a difficult and uncertain process. The difficulties and uncertainties depend directly on the size, complexity, novelty and technical sophistication of the project, often compounded by the presence of constraints on time, resources and performances, and frequently exacerbated by conflicting objectives for the parties involved.

Although the incidence of risk and uncertainty have been recognized as important factors within the building process, evidence shows that their effect of the progress of the project are overlooked or underrated and this leads to the detriment of the overall project. Perry, J. and Hayes, R.W. (1985) state that 'experience of many projects indicates poor performance in terms of achieving time and cost targets. Many cost and time overruns are attributable to either unforeseen events (which may or may not have anticipated by an experienced project manager) or foreseen events for which uncertainty was not appropriately accommodated. Risk and uncertainty do not occur only on large capital projects. While size can be one of the major causes of risk, other factors include complexity, speed of construction and location of the project.

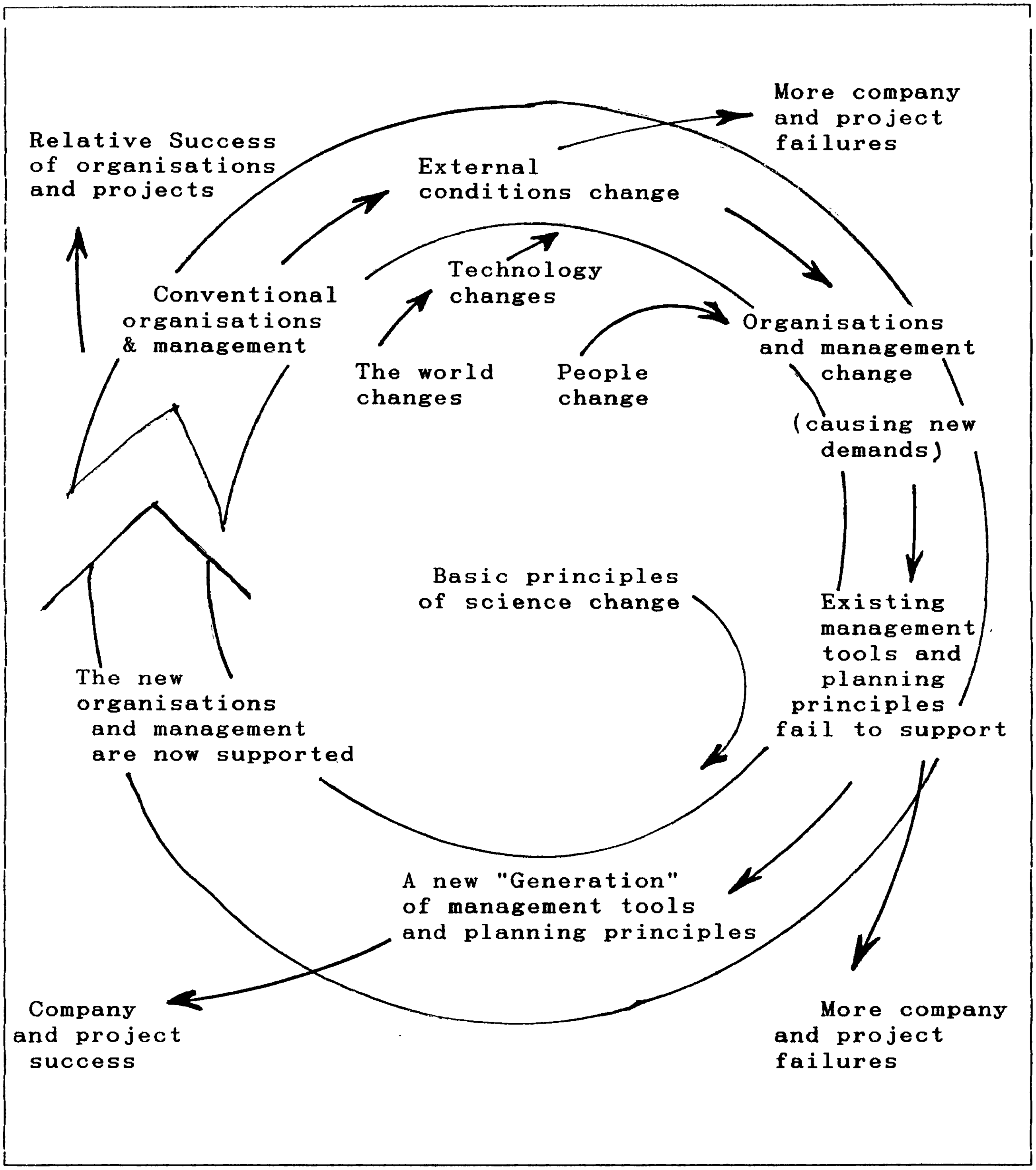
The necessity of recognition and management of risk and uncertainty in the building process and the consequences of these factors have been picked up by the large banks and donor organizations such as the World Bank, the ADB and the ODA.
The ODA 'Guide to Cost Estimating' (1989) states that the extent of risk and uncertainty associated with construction project, particularly in remote locations is considerable, and should not be underestimated. Risk and uncertainty must be thoroughly considered in all project estimates - from the initial preliminary estimate through to the post-contract estimate in all subsequent forecasts of final cost to completion.
The World Bank in its publication 'The Construction Industry: Issues and Strategies in Developing Countries' (1984) states after detailed examinations of surveys and reports of the construction industries in several countries, that 'construction entrepreneurs must face a daunting array of risks. Fluctuation in demand heads the list. It is a risk over which the industry has very little control and affects construction more intensely than other sectors of the economy.' It however lists three types of risk which can be assessed and managed by the construction

industry. These are (i) Inherent risks: arising from the assumptions made at the time of bidding - among them work organization, labour and equipment productivity, procurement and expediting of materials, and weather conditions.
(ii) Insurable risks: which include damage to property, health and life of employees, third party liability and certain commercial risks. (iii) Transferable risks: these are conveyed to others by contractual arrangements; for instance, some production and consequential risks can be transferred to subcontractors, suppliers and transporters.

The ability to handle these risks depends on the experience of the manager and the estimator, the adequacy of cost control and feedback, and the quality of the information available on the site and other local conditions. This is an area in which many managers fall short, as is explained by Koblach, P. (1990) in which he observes that 'for many major international infrastructural projects it is not easy to recognize the full scope of risks which a contractor may encounter by performing such works, especially if the country in which the project is going to be executed is new to him.
Canessa, E. (1990) expands this further by stating that 'projects developed abroad can be subject to the same risks as those carried out in one's own country, but they are open to additional risks by virtue of the fact that one is working in an alien milieu, possibly in a foreign language, with unfamiliar custom, professional practices and technical norms, and perhaps even different ethical standards to what one is accustomed. All these can give rise to misunderstandings, delays, frustrations and additional costs. Some can be avoided; others can, at best, be reduced; but all can be managed to some extent by being aware of the possibility of their occurrence, and by taking measures in advance to mitigate their effects.' He goes on to list some of these risks as language, professional practises and standards, ethics, reliability of information, legal restrictions, customs and practices, bureaucratic procedures local resources, and the unexpected.

These risks are not set or defined for particular countries or regions for ever, such that a factor that was a potential risk in one country, say Ghana, could arise in another country such as Britain in another form or dimension; or could be eliminated altogether due to advances in technology or transportation.
Lichtenberg, S. (1990) says that 'the world changes dramatically these decades. The environment in which managers work, changes; and so do people and technology, and this leads to a turbulent, rapid shifting environment in which managers find themselves in. (See Fig 1.1)

The success of a project depends amongst other things, on sound project management, and today there is technical aid available which allow a more thorough analysis of potential project risk exposures. Project risk identification and management have reached a level of maturity where it is no longer necessary to rely on the estimator's or project manager's "gut feel" to minimize the negative impacts of encountered risks. (Ashley, D. 1988).



A Mega cycle of Cause-effect in Management, in the period from the 1950's to the 1990's.

Source: Lichtenberg, S., (1990)

Fig 1.1

1.2 THE CONCEPT OF RISKS IN CONSTRUCTION

Risk and Procurement Method

The management of risks in construction have been the basis of the various forms of procurement. The way in which the different contracts shift allocation of risks provides the most illuminating way to study changes in procurement. In an attempt to alter client dissatisfaction with the outcome of the traditional procurement systems, and the adversarial relationships that have existed between the members of the project team, many new forms of procurement have been tried over the past fifteen years or more. They range as follows:

- projects which embrace **clients design**, against those in which the contractor is wholly responsible for design;

- projects where the **contractor takes all operational risks**, against projects where the contractor takes little or no contractual risks;

- projects where the **contractor is fully responsible** for the whole process, to projects where there is no main contractor;

- projects where there is a **single point** of responsibility for the total process, as against projects where the client will have a multitude of separate contractual agreements;

- projects which use industry standard forms of contractual agreements, to one-off 'bespoke' contractual agreements drafted by lawyers for individual projects.

(See Appendix and Glossary for full description of procurement methods)

Risk and Project Organisation

As construction involves both financial and physical risks, the owner or client generally tries to shift the risks to other parties to the degree possible when entering into contractual agreements with them. Such action can however lead to higher costs, as the party to whom the risk is assigned can ask for a higher contract price to compensate for the higher risks or end up in nonperformance or bankruptcy as an act of desperation. Such consequences can be avoided if the owner is reasonable in risk allocation. Since each party tries to minimize his own risk the conflicts among various participants can be detrimental to the project. Only the owner has the power (through his project manager) to moderate such conflicts as he alone has the key to risk assignment through proper contractual relations with other participants.

Uncertainty and Risk
In approaching the problem of uncertainty, it is important to recognize that incentives must be provided to participants expected to take greater risk. The willingness of a participant to accept risk often reflects his professional competence as well as his propensity to risk. Since future events are always uncertain, all estimates of costs and benefits used in economic evaluation involve a degree of uncertainty. Probability methods are often used in decision analysis to determine expected costs and benefits as well as to assess the degree of risk in projects. (See Fig 1.2)

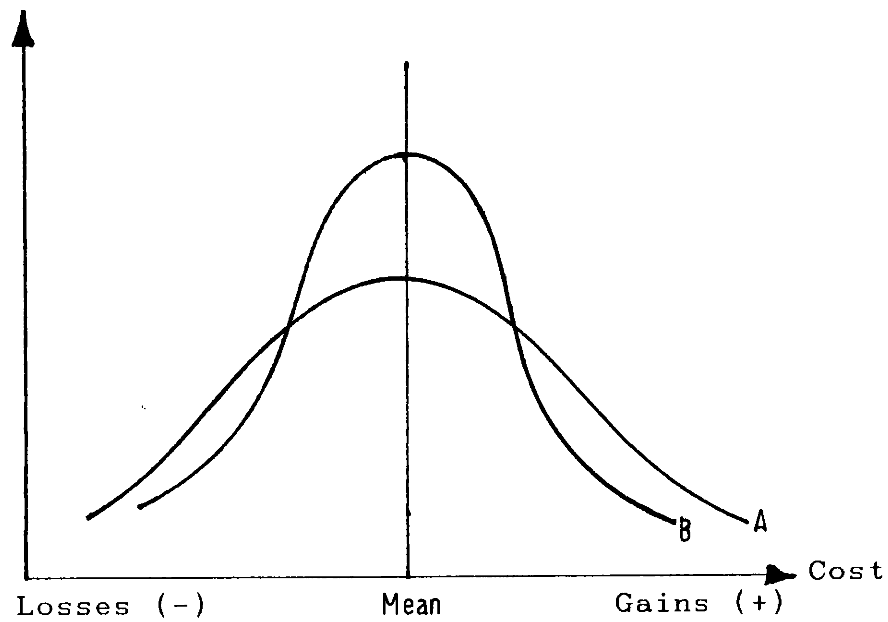
The Degree of Risk
Some of the characteristics of any risk element that determine its importance to the decision maker are:
- the potential frequency of loss.
- the amount of information available to define its potential,
- the potential severity of loss,
- the manageability of the risk,
- the vividness of the consequences,
- the potential publicity should the loss occur, and
- the ability to measure the consequences of loss.

(see example in appendix).

One more element which might be added to the above list is 'whose money is it?' Individuals tend to be more reckless in managing assets belonging to parties other than themselves.
It appears that severity of potential loss is the one factor that attracts the attention of decision makers more than any other. Individuals are willing to accept small (even frequent) losses, but are risk averse to a risk which has high stakes.

Percentage

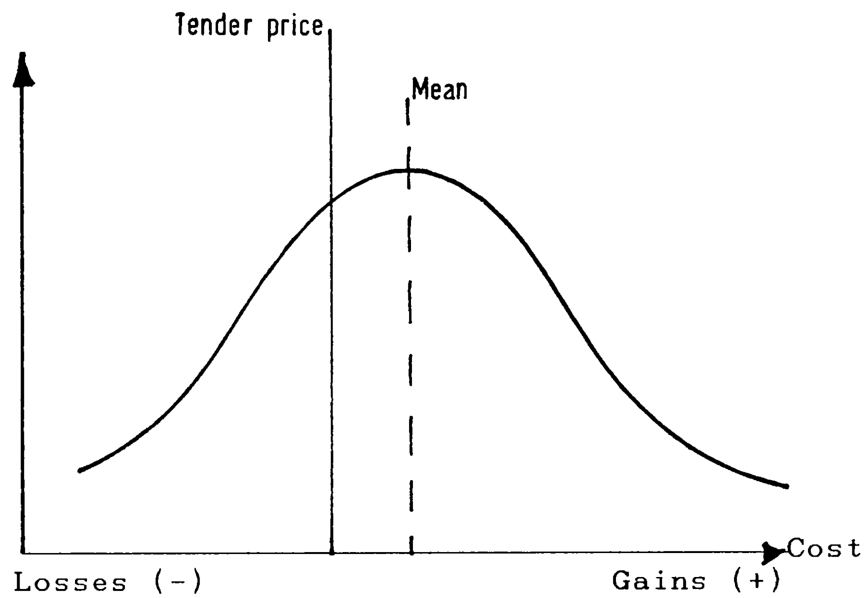
Probability



Although most decision makers assume risk taking means losses, gains can be made if costs fall below the estimate.

Percentage

Probability



Competition forces tender price towards the left and fewer gains are made.

Fig 1.2

CHAPTER 2

This chapter traces the development of the procurement system, and the development of responsibilities of the parties to the contract in Britain and Ghana.
For large construction projects of today, the main parties to the contract are (1) the financier or funding agency - to provide the large injection of capital that is often needed for projects of this nature, (2) the client, (3) the clients representative or agent, (4) the professional consultants, and (5) the contractors organisation. The users of the facility are not usually part of the contract.

2.1 THE BRITISH PROCUREMENT SYSTEM IN THE TWENTIETH CENTURY

During the first half of the twentieth century, the state became the principal client of the construction industry, and many local authorities set up their own direct-labour building departments. Politics at the local and national level played an important role in the development of the industry. One of the most significant changes brought about by the stat was the introduction of central-government subsidised local-authority housing after 1919. (Ball, 1988). Architects and contractors were able to experiment with novel ideas of building and design techniques with the local authorities as client who had to show an interest in, and sponsor research and new methods. Disputes between architects and contractors were especially fraught between 1900 and 1937, with either party refusing to recognise each others' form of contract. After careful negotiation, the Joint Contracts Tribunal (JCT) with representatives from the contractor, architect, surveyor and public sector clients organisations, was set up. The JCT form of contract was finally approved in 1937. Revisions and amendments have been made to it since, reflecting the balance between the professions and contractors. (Ball, 1988).

After the 2nd World War, there was obvious unease about the organisation of the contracting system to cope with the building process, and critical official reports were presented. In addition to dissatisfaction with the performance of the system, there were other factors which influenced changing attitudes of the professionals in the building industry. Bowley, (1966), sums these up as (i) the effects of war and government policy and market changes; and (ii) changes in the supply in the post-war world - scarcities, technical change and control of design. There were three principal post-1945 innovations that were tried following the abandonment of competitive tendering - where any firm can tender for a project and the public client is generally obliged to accept the lowest bid. These new forms of procurement were **selected tendering, negotiated contracts** and **serial contracts**. (Ball, 1988). Within the last thirty years, contracting has seen a number of new forms of procurement existing alongside the Traditional Form of Contract. The ones in use today are Construction Management, Management Contracting, Design and Build, Turnkey Contracts. The latest one is the New Engineering Contract.

2.2 THE GHANAIAN PROCUREMENT SYSTEM IN THE TWENTIETH CENTURY

In the colonial days, the construction professionals that had developed in Britain were exported to then Gold Coast: architects, engineers, surveyors (including quantity surveyors) and building technicians. Building procurement was organised along that of the system prevailing in Britain. The demand for construction was mostly made up of private residential building, office blocks and bungalows for the government, and heavy infrastructural projects. The private houses were built by the informally organised local contractor who was usually an experienced tradesman leading a group of workers. The public sector contracts were handled by the PWD (Public Works Department) and the expatriate firms that were in the country. On very large contracts such as harbours, contractors were invited from abroad (Ofori, G. 1980). After independence, the Ghanaian government embarked on a massive development programme - roads, schools, hospitals, office blocks, housing and factories. This encouraged the quick emergence of contractors in the country. Several expatriate firms were also attracted to Ghana. Due to the limited knowledge of their proprietors, the Ghanaian contracting firms remained small, although they continued to grow in number. But projects were becoming more technically sophisticated, with the result that the expatriate firms had a large share of the volume of demand for construction to themselves and were in a position in which, if they wished could have formed a cartel and dictated prices. To forestall this development, the Ghanaian government found it necessary to create a large Ghanaian contracting organisation which could compete effectively with the expatriates. Thus the State Construction Corporation (SCC) was formed to engage in commercial contracting. The Architectural and Engineering Services Corporation (AESC), the Ghana Highway Authority and the PWD are government owned organisations. There are para-statals such as the regional development corporations and the State Housing Corporation which have their own private consultancies. The forms of contract used are very similar (although necessary modifications have been made) to their British counterparts: the RIBA forms of contract, the JCT forms of contract, the ICE conditions of contract and the Local Authority forms of contract (Ofori, G. 1980). [1]

[1] See Appendix page 55 for historical review of the British & Ghanaian Procurement Systems.

2.3 ESTABLISHING A COMMON BASIS FOR COMPARISON: THE MANAGEMENT OF RISKS

A review of the Ghanaian construction industry at the end of the 70's stated that "Having borrowed its organisation from the United Kingdom, Ghana's construction industry has failed to institute the changes and refinements that have been made to the British model. The contractor is never involved in the project at the design stage, package deal contracts have not been tried, and the idea of project management consultancy is yet to be introduced. The same type of organisation is used for each project, no matter what special factors need particular attention and, therefore, which members of the team should assume leadership. On a particular project, moreover, the approach to the solution process is artificially fragmented into various stages that have been partitioned among the professionals and are jealously guarded. For example, the quantity surveyor's advice on costs is seldom sought at the design stage: the techniques of cost planning are, therefore, not utilised in most designed. This state of affairs is unfortunate because construction is a process in which the solutions of one subgroup become the tasks of the next: the tasks should, thus, be interwoven and inter-related, and there is need for more flexibility in the organisation of project teams." (Ofori, G, 1980).

During the last decade, there has been a shift in the attitudes towards construction projects. The clients of the construction industry - private developers, individuals, consortia etc, parastatal and public - ministries etc, have realised that poor management leads to poor outcomes of projects.

Being a developing country the cost of projects overrunning their time, cost and quality estimates have a profound effect on overall development - often setting into motion a vicious cycle which is extremely difficult to break.

The various ministries, departments with a continuing need for construction have in recent years established 'project divisions' to act as clients' project managers.

An effect of importing the organisation of construction from Britain means that the shortcomings of <u>the system</u> were imported as well, and the adversarial problems that are evident in the British contracting system are persistent in the contracting system in Ghana, and most commonwealth countries.

The forms of contract used - the traditional form of contract and its variations have stood the test of time.

However the need for the design to be fully developed before tenders are prepared leads to an 'end-on' design/build arrangement. Such an arrangement frequently requires a longer overall project period than is necessary if both design and construction are able to proceed concurrently.
As the length of the project period increases, so doe the project cost because the client usually incurs financing charges on the

sum which he has invested in land purchase, interim payments to the contractor and other members of the building team.
The fees of the architect and other consultants are usually on 'recommendation scales' and there is little or no competition between them on fees.
Some contractors are of the opinion that their ability to organise and control the work of nominated sub-contractors is undermined by the nomination process, because such sub-contractors have less loyalty to the contractor than to the architect who nominated them.
The separation of the design and construction process tends to foster a 'tem and use' attitude between the designers and contractors which reduces the team spirit that experience has shown to be vital for the satisfactory conclusion of a building project.
Lines of communication between the parties tend to be tenuous and the interests of all may suffer as a consequence.
The traditional system has been proved to be unsatisfactory for some large and complex projects which require advanced management systems, structures and skills. (Franks, J., 1984)

The success of large construction projects in both Britain and Ghana depends on how the various parties to the contract carry out their responsibilities and manage their risks. Total project risk is a function of the technology of the project (it's size, complexity and originality) and the economic environment. Who bears what risk depends on the project manager.

Effective project manager can shift risks to other parties as well as reduce risks. The sum of all risk assessments is less when there is clarity about who bears what risk. Therefore good project management can help the project perform better by making each party more aware of their responsibilities, thereby improving the performance of the parties and the overall performance of the project.

The key concept therefore is successful management of large construction projects is explicitness of duties, tasks and responsibilities.

CHAPTER 3

This chapter reports the results of a survey conducted in Britain and Ghana. The survey consisted of in-depth interviews with various organisations involved in the procurement of large construction projects, and how they managed procurement through managing of risks of cost and time quality. An analysis of how their procurement systems have altered is discussed in the next chapter.

A total of nine organisations were interviewed and they are classified as follows:

	TYPE	BRITAIN	GHANA
1)	FUNDING AGENCIES FINANCIER	O.D.A.[2] A.D.B.	 SSNIT
2)	PROJECT MANAGEMENT	BOVIS	TWUM BOAFO & PARTNERS
3)	DEVELOPER	STANHOPE	KUOTTAM
4)	CONTRACTOR	TAYLOR WOODROW	TAYSEC

A sample of questions asked is as follows:

1) In what capacity do you act within the project organisation?
2) What risks do you identify within with the project organisation?
3) To whom do you allocate which risks.
4) What are the policies governing the allocation?
5) What differences are seen when different parties are allocated different risks?
6) What are the main risks facing your organisation?
7) How do you manage the risks that your organisation faces.

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[2]ODA - Overseas Development Agency
ADB - African Development Bank
SSNIT - Social Security and National Insurance Trust
TAYSEC - Taylor Woodrow (Int) Society Security Bank Ghana Ltd

3.1 RESULTS OF THE BRITISH SURVEYS

MANAGING RISKS IN PROCUREMENT OF LARGE CONSTRUCTION PROJECTS.
FUNDING AGENCY/FINANCIER

ODA: (OVERSEAS DEVELOPMENT AGENCY)

Managing Time

The ODA finds that estimating time risks is very important to the development of projects. Timing of projects is very crucial, e.g. poor timing of floods in relation to construction of sluice gates of a dam could throw a project out of programme for at least a year. To keep within schedules, the ODA analyses the factors which could affect the project and then cost the delay in a certain rate £x per time period.

The work out the probability of that risk happening and then work is into the overall timing and cost of the project. Given more time for assessment of a project, a cheaper figure could be obtained because a more detailed risk analysis can be carried out. More time is needed to make a better decision and undertake a better survey.

The ODA finds that estimating the possible risk with the concept of looking at each individual component and its probability of occurrence is a very important tool for informing decision makers (who do not the necessary technical background) about what is likely to affect the project.

In the past, financiers and donors of funds used to act like bankers as long as they were in receipt of the interest payments on the loans etc., they did not concern themselves with how their funds were utilised. Growing concern about the projects falling short of expected targets has led to financiers and funding agencies getting more involved in the management of projects.

Managing Cost

The ODA has developed a cost-estimation guide to identify its risks of cost overruns. They find Liquidated and Ascertained Damages (LAD) clauses a flawed instrument - These are very often very difficult to prove. The ODA does not place too much emphasis on penalties, but rather on bonuses or milestone payments for finishing specific pieces of work. Therefore the contractor can mae extra profit if he finishes early, or lose money if he finishes late. In the past, procurement methods, a contingency sum was added to arbitrarily to the contract sum, but better results are obtained with the use of realistic assumptions.

Managing Quality

An increased supervisory presence is maintained on all projects, with the clients representative (either an engineer or an architect) responsible for quality. No payments are made until quality standards have been met. The ODA also undertakes certain projects which are specifically aimed at training (in the process, a project will be completed) personnel. Contractors are pre-qualified and are given the terms of reference for the projects. Supervision and monitoring begins from the pre-tender stage through to the end of the construction phase.

ADB: AFRICAN DEVELOPMENT BANK

The London office of the ADB was interviewed in this survey. The ADB is committed to the development of the African States, and as such it has more involvement in the projects it finances. Good management of development projects lead to the overall development of the member states. The converse is also true.

Managing Time

There are provisions made in the contracts for delays due to contractors or borrowers. Time overruns are exacerbated by problems in communication between the parties to the contract.

Managing Cost

The main risk facing the ADB is financial risk; and it protects itself by ensuring that its loans are secured by the recipient governments. Private sector clients use their assets as securities for loans - although some problems are faced due to lack of understanding of banking procedures by some private customers.

Managing Quality

Committed as it is to the overall development of the member states, the ADB is very strong on quality. There is a pre-qualification identification during the feasibility studies. A pre-project survey is undertaken and discussed with the client. Supervision is very important, and the ADB undertakes launching missions, supervision missions, follow-up missions and post-evaluation missions.

PROJECT MANAGER

<u>BOVIS</u>

Managing Time

To keep within time schedules Bovis uses the phenomenon of early letting of contracts and sub-contracting.

Managing Cost

The Return On Capital Employed (ROCE) is very great because Bovis employ very little of their own capital on site, and offer a management service primarily.

Managing Quality

Clients are offered a full range of services under the Bovis umbrella thus high standards of quality are maintained.

DEVELOPER

STANHOPE Properties

Managing Time

Stanhope uses techniques of construction - speed, efficiency and safety to work to time schedules. Design and construction are overlapped when 70% of the package value is known. There is more emphasis on off site prefabrication of component combined usage of plant and also improved quality control measures.

Time Management techniques such as critical path analysis based on specific performance targets are used. This gives more realistic targets.

Managing Cost

Stanhope absorbs more risks of costs due to the form of contract used. All pricing is on a Lump Sum Basis. Stanhope chooses to absorb more of the cost risk because they can better manage that risk, and obtain rewards from it.

Managing Quality

Stanhope gives performance specifications, and the Trade Contractors produce the building within the specifications. The brief is made clear - from a generic brief narrowed down to a specific brief - right from the start. Component professionals are used, and a system of checks and balances between the various consultants is encouraged. Value engineering is also encouraged.

CONTRACTOR

TAYLOR WOODROW INTERNATIONAL

Managing Time

It is the policy of Taylor Woodrow International to finish all jobs, in such events that could affect the timing of the projects, such as bad weather, etc., is included in the pricing for the job.

Managing Cost

This is the main risk facing Taylor Woodrow, especially regarding overseas projects.

Cost control measures are used to assess incomings and outgoings, and the speed of the project is controlled according to the funds available. The bills of quantities is set out to mitigate the effects of negative cash flow situations. It is priced in two currencies - local and off-shore currency. In countries where payments are delayed, the contract price is adjusted to take care of this.

Managing Quality

Taylor Woodrow uses its own senior personnel and undertakes training of operatives. It is the policy in the interest of Taylor Woodrow International to produce a good job, as their reputation is at stake.

3.2 RESULTS OF THE GHANAIAN SURVEY

FUNDING AGENCY/FINANCIER
SSNIT (Social Security and National Insurance Trust)

Managing Time

SSNIT accepts the risk of time overrun (if proven) otherwise the contractor pays liquidated and ascertained damages as usual. To keep programmes as simple, SSNIT prefers working with a consortium - with a single point of consultation, as against using separate contracts with several points of consultation and far higher risks.

Managing Cost

SSNIT bears the risk of inflation and price increases - it stocks and distributes the major building materials to its contractors. SSNIT buys in bulk and uses just-in-time supply system to the sites to eliminate cost of warehousing. The in-house quantity surveyor liaises with the appointed quantity surveyors to keep within the budget. SSNIT keeps to prompt payment of contractors to ensure positive cash flow and good project timing.

Managing Quality

SSNIT ensures that quality is maintained by its policy of supplying some of the building materials. Contractors work to performance specifications.

PROJECT MANAGER

TWUM BOAFO AND PARTNERS

Managing Time

Twum Boafo tries to influence decisions by proposing project times. Allowances are made for inclement weather depending on project type, e.g. roads. LAD clauses are used (if proven) or else the client bears the cost of any time overruns. Twum Boafo maintains staff on site to monitor the progress of the project.

Managing Costs

Method related charges are used on some civil engineering jobs and the client and contractor share this risk. A contingency sum is included into the contract to take care of unforseen conditions; but the cost of abnormal conditions, e.g. unforseen ground conditions is absorbed by the client. A price escalation formula is used when the client absorbs the risk of currency fluctuations. The risk of material and labour shortages is allocated to the contractor.

Managing Cost

Twum Boafo maintains laboratories on site to monitor contractors works. The contractors are also expected to install their own laboratory facilities (this is included in the contractors pricing).

DEVELOPER

KUOTTAM

Managing Time

Kuottam makes allowances for unknown conditions in its contracts - yet finds that most projects exceed their timing by about 10% of the contract period. To reduce time overrun due to shortage of materials Kuottam keeps some building materials in stock.

Managing Cost

Kuottam stocks materials in anticipation of more contracts hoping to achieve savings as a result of reduced importation of materials, and also as a result of bulk purchasing.

Deposits are obtained from prospective clients, while risks of currency fluctuations are absorbed by Kuottam.

Managing Quality

In house quantity surveyor and quality control staff liaise with external consultants and sub-contractors. Contractors work to performance specifications.

CONTRACTOR

TAYSEC (Taylor Woodrow & Social Security Bank)

Managing Time

Use of float is not excessive; Taysec uses its previous knowledge of the country's conditions to plan the amount of resources and time needed for the project.
Taysec uses modern programming techniques, e.g. critical path analysis and activity weeks. Taysec keeps its own plant to eliminate time loss due to inadequate plant hiring facilities. To ensure maximum use of their plant, they ensure that their order book is full for the next five years (or so).

Managing Cost

This is the main risk facing Taysec. To avoid the risk of non-payments the choice of client is an important part of decision-making. Financial stability (especially of private clients) is well checked out before embarking on any project.

Taysec seeks payment in advance to ensure that the project remains cash positive. This keeps down the contract price. Loss or pilferage is accounted for during the pricing of the bills, (which is in two currencies - off shore and local/on shore). Taysec seeks protection of rates in countries with high inflation to ensure a good reputation.

Managing Quality

Taysec employs a Quality Assurance service on certain jobs such as airports, etc. They undertake training of operatives and middle management, and sub-contract as little as possible with regards to projects in say West Africa. The converse is of course, true for British projects, where almost the whole of the project is subcontracted out.

3.3 SUMMARY

FUNDING AGENCY/FINANCIER

SSNIT bears more of risks of time, cost and quality because they believe that time, cost and quality because they believe that it otherwise would not make it worthwhile undertaking these giant projects. The increased level in contract prices is passed onto the users (SSNIT has not difficulty in the sale of their speculative projects). Being aware of the number of risks involved in the procurement of large construction projects, SSNIT is seeking to reduce its risks by limiting their involvement in the procurement system. SSNIT would prefer to be a pure financier of housing projects (set up Home Finance

Companies with the government); and build contracts only for non-residential schemes and finally to increase activities in infrastructure development. The Contracting system used has not been changed or altered in recent years.

The ODA is changing its policy of procurement. In the 1960's, the Western Contractors tended to use contracts which pertained in their home counties, and which they understood. This worked so long as they workforce and personnel came from those same countries; the assumption was that the local expertise would take over the maintenance of the projects. Often, however, the materials and methods of building were foreign and inappropriate, and there was a lack of back-up facilities to ensure that projects were maintained. In developing countries there is often inadequate background information to a project and the traditional forms of add-measure contract may not be adequate or appropriate. Target Cost Contracts and Cost Reimbursement Contracts may be more appropriate for some of these projects - however many clients are suspicious of cost reimbursement contracts, and moreover there is not enough incentive for the contractor to innovate.

To ensure that projects are managed realistically and the ODA now uses risk management analysis as part of its procurement method.
The ADB is committed to the development of member states, as such it has a moral duty to be more than just financier of African development projects. Being a profitable bank, it is attracting a lot of investment, but realises that political and economic reforms of its member states is necessary. ADB monitors the progress of projects, but leaves the implementation of projects to the borrower.

The main form of contract used is FIDIC[3]. There are problems which arise due to borrowers lack of understanding of bank procedures or contract conditions not being adhered to by local contractors[3]. The main risk that the ADB is concerned about is financial risk and it seeks to reduce this by close monitoring of projects. It realises that changes in the terms of contract are necessary to improve performance targets.

PROJECT MANAGERS

Procurement of projects in Ghana is increasingly under project managers. Shortcomings in the contract are evident; local contractors do not keep to time programmes (often using the whole

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[3]Paragraph 20-(2) lists 'Excepted Risks'. Listed are 'War', 'hostility', 'riot' etc and goes on to mention 'or any such operation of the forces of nature an experienced contractor could not foresee, or reasonably make provision for or insure against'. There is therefore no clear definition or limit to 'Excepted Risks'.

of the contract period for mobilisation) but the form of remedy used is the liquidated and ascertained damages clause. Project managers try and cut down risk of time overruns by advising clients to give advance mobilisation loans to contractors, but due to poor management local contractors also bud too low in an effort to secure jobs and end up absorbing excessive risk of time and cost, with the result that quality suffers. Project managers need to evaluate contractors track record and also to evaluate the forms of contract used.

Recapitalisation and maintenance of local contractors is necessary for them to remain competitive, but this should be a part of government policy.

DEVELOPERS AND CONTRACTORS

Developers and contractors in the LDC's have realised that the existing forms of contract used lead to failures in projects which cannot be corrected with increased wages or incentives. The same is true of their counterparts in Britain. The more successful projects are those which are analysed realistically during pre-bidding stages. Taylor Woodrow International and Taysec (Ghana Ltd.) demonstrate that by proper assessment of the country, they are able to manage the project well. Stanhope analyses and identifies risks which it can absorb and then demonstrates that rewards can be gained by good management.
Their procurement methods are thus adjusted to meet the circumstances. On the other hand, Kuottam is still running its projects based on LAD clauses and penalties.

A proper analysis of their contracts in terms of risks that could affect the works would give better results and preclude the use of adversarial measures (such as LAD clauses) and increase the use of milestone payments and bonuses.

CHAPTER 4

4.1 SOURCES OF POWER IN PROCUREMENT METHOD AND IMPLICATIONS

There can be various reasons cited for the causes of changes that have occured in the procurement of large construction projects both in the developed and in the developing world.

The underlying reason being disatisfactionwith the outcome of the Contracting System - the specific but ambiguous roles for architects and other design professionals, surveyors, building contractors and for organised labour (Ball, M.,1988). He states that post war development in the construction in Britain can be divided into three periods. The first is the early post-war years of construction and consolidation of the dominant relationships between agents in the construction process, lasting from 1945 up to 1953-4; second are the 'golden years' of rapid expansion and full employment, from the mid-1950s through to the early 1970s; and, finally, come the years of retrenchment and restructuring up to the present day. He goes on to say that although it is evident that the Contracting System has crumbled in part, there is good evidence to show that the larger buildilng firms have been able to take their ability to ride the crisis to improve their position in relation to building workers and professional. There is still life left in the industry's social relations, but future developments are unclear.

Some methods of procurement of large projects are caused by the most dominant power in the parties to the contract. This can have adverse consequences if dominant power has other personal reasons for entering into the procurement agreement.

Clients, the ones who are in control of the finances, are in a dominant position and could have a very powerful influence on the success of projects. Morrell, D., (1987)[4] feels that power lies in the hands of a few clients, and therefore they have an enormous potential for changing the system for the better. 'There is,' he said, 'at present time, a tremendous amount of work which virtually falls within the personal gift of a handful of individuals. Reference is sometimes made to the apparently attractive idea of using the purchasing power of the public sector to impose new patterns. One would be happier if one could see flowing from these influences an automatic good. Unfortunately, there has been little evidence to date that we are making significant progress; rather the reverse. We must look forward to the time when, as I would see it, under the authority and leadership of the engineer, but in a spirit of mutual respect, we start to bring our total product more into line than we do at present with the expertise and resources which we collectively deploy.

[4]See 'Indictment - Power and Politics in the Construction Industry by D.Morrell (1987)

Forms of procurement of large projects which are client dominated and politically motivated have dire consequences on users, as is shown in the example of the King Feisal Specialist Hospital, Riyadh[5].

This hospital is a wonderful example of all that is the latest in technology, but at great cost. The hospital is claimed to be the world's most advanced and it has certainly been a showpiece for visitors to Saudi Arabia. it was intended to translate into practice a 'dream' of King Feisal. He wished to provide the latest that medicine, engineering and modern technoloy could provide for the health care of the people in his country. Unfortunately, the King did not live to see his dream fulfilled. Indeed, although the hospital is now completed and in 'operation', his dream is still not fulfilled. He died a few weeks before the hospital was finally opened, in 1975.

The hospital is now described as a 'white elephant', a classic example of 'everything that has gone wrong with modern technology'. These are the words of Dr Kenneth Williams, the British physician who planned the hospital and helped to create it. He now laments: 'It was a fascinating case study in the uncontrolled use of money'. First estimated to cost come $10 million, the final price tag is believed to be $250 million and one can but wonder, in retrospect, whether these figures could ever relate to the same project. It may be thought of as a showpiece, but what does it actually show? It shows the way in which the latest technology, together with greed on the part of contractors and medical hardware supliers from the various countries involved, can escalate health care cost to dazzling heights.[6]

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[5]See 'How to Learn from Project Disasters - Chapter 3. - Developing Countries are Difficult. Kharbanda & Stallworthy (1984)

[6]This 250-bed hospital is the very first in the developing countries with an integrated computerised technological system. There are 18 computers, and the system processes all sorts of data, from a patient's case history to planning the menus, and finally printing the bill. Cardiac patients are each 'hooked' into their own individual computer terminal, thus registering the vital data, such as body temperature, blood pressure and pulse rate. Intensive care patients are televised on a 'closed ciruit' system so that doctors and other personnel can maintain a close watch while sitting in their offices. Operations are filmed and recorded on video tape in full colour. With such comprehensive automation one would surmise that far fewer staff would be required as compared with the average hospital, and that the doctors would 'have all the time in the world' to devote to their patients. The converse is true. The total staff numbers some 1200 and is still increasing. The patients have become mere numbers, lost in the complexity of the machine. The personal touch, so essential for confidence in the staff, and cure, is completely missing.

Although this hospital was originally a British concept, it was actually built by a Lebanese contractor, using technology and hardware from America, Britain, Europe and Japan. It is now managed by the Hospital Corporation of America. This health care project became a political football, the hospital a stadium and the patients merely spectators! For the person who first planned the project, Dr Williams, the dream now only exemplifies an escalation in health care costs that brings no reward, the transformation of a noble cause into greed and corruption, while at the same time the patient, for whom it was all being done, has been dehumanised.

This highlights the point that in user countries suffer greatly when projects in developing countries are badly managed.
Without cost control, all involved had a 'field day'. Everybody is happy except the patients themselves, for whom the hospital was actually built. Because it is so out of place, the hospital remains completely vulnerable. One fuse blown, one spare part missing, and a technician has to be flown across the world to make an on the spot investigation. Meanwhile, the patient goes home, or goes ....?

Apart from shifting risks onto the eventual users of the project, the dominant party can shift risks onto other members of the contract. It can also devise a form of project management in which the total risk is reduced. In Britain, evidence shows that it is the client's organisation which has the dominant power, while in LDCs such as Ghana, it is the funding agency which is the dominant power. When the most powerful party is benign, they will set up a system in everyone's interest; on the other hand if the dominant party is risk averse, it will set up a system that places excessive risks on the other parties concerned. In some cases, the contractor organisation is the dominant one, as explained by Ball, M. (1988).
Rapid expansion of construction output during the years from early 1950s to the early 1970s consolidated the position of the large building contractors in the industry. It also kept to a minimum any potential conflict between contractors and design professionals over their contradictory management tasks and responsibilities within the construction process. Clients could be forced to endure the consequence s in the form of high costs, delay and poor quality, in a frequently overstretched market. It was during this period that Marion Bowley wrote her famous indictment of ther negative effect of design 'Establishment' on the construction industry (Bowley, 1966). Both builders and designers, in fact, could profit through contract claims procedures; and designers through their fixed percentage fees. They were, in fact rewarded for creating higher costs!
This had an effect on client organisation who became very suspicious of contractors and risk averse.
An example of an imbalanced distribution of construction risks between client and contractor occurred on the following project:

Grain Silos Jeddah, Saudi Arabia[7]

The client had a soil investigation which was inaccurate. it resulted in wrong foundation which caused settlements in an unexpected range. The situation caused 11 years of trouble because the client never admitted his deficiency. 11 years were required to reach an understanding and the final solution to create controlled additional settlements by controlled special leadings of the silos. The cost was to be equally shared by the client and the contractor.

Procurement methods using a coalition or concensus model have been discussed at length by other parties such as the Tavistock Institute. Studies on the building industry had shown that in the technical field rapid and dramatic developmetn has also taken place, side by side with social change. In the adminstrative field, however, no comparable metamorphosis has occurred in the roles of those who, jointly and severally, are responsible for controlling the building process. The disparity in development between the social and technical functions on the one hand and the administrative functions on the other is the root cause of difficulties which show up clearly in communications.

Their study states that the first important characteristic to be recognised is interdependence between the parties. Therefore a procurement system which reduced risks all round is genuinely in the interest of all the parties (through of course, one party will gain more than the others). An example of such concensus occurred on this international project.

Harbour Takoradi, Ghana[6]

This job was won under international competition and started it with a tough price. With the consent of the engineer and the client, the contractor had the possibility to change certain specifications with regard to asphalt, interlocking pavement, etc. to mutual benefit. Since this was an accepted advantage for the client and the site was operated well the contractor was entrusted with all additional works for which funds were available. They more than doubled the original contract sum and everybody was happy.
Though the contractor achieved most gains, risks were reduced to the client organisation and the users as well.

As power within procurement methods clearly rests more with one party than the others, a careful risk evaluation undertaken by the management team is very useful in assessing the degree of risks and taking action where necessary.

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[7]Source: Contractor's Risks in Large Infrastructural Projects. P. Knobalch (1990)

CHAPTER 5

5.1. SUMMARY AND CONCLUSIONS

Risk and uncertainty are inherent in all construction activities. They carry with them the potential for time, resource and monetary loss. These risks are divided among the project participants in various ways depending upon contract format and language. (eg. the fixed-price construction contract places particularly heavy risk upon the contractor, while a reimbursal contract places it on the owner).[7]

An examination of the different forms of contract reveals that the main difference is how the risks are allocated to the different parties to the contract. Certainly all in the construction professions agree that risks are found in every project. See Fig 5.1. Safety risks are inherent in construction activity; business risks are associated with any venture involving contracts, multiple agencies, time and money; performance risks are associated with producing goods and services with a constantly changing human work force operating under variable weather conditions and the uncertainties of materials and equipment deliveries; and liability risks threaten every business in our litigious society. We also are painfully aware of examples where failure to manage those risks has resulted in significant losses to the contractor and the client.

If we are to manage the risks inherent in a project, we must first identify those risks. We find that construction projects, like individuals, are subject to risks which can result from known, known unknown, and unknown unknown conditions.
Leaving these risks and uncertainties uncatered for in a building contract, which is complicated just by the sheer nature of it, leads to substandard bits of work for which no one is held accountable.

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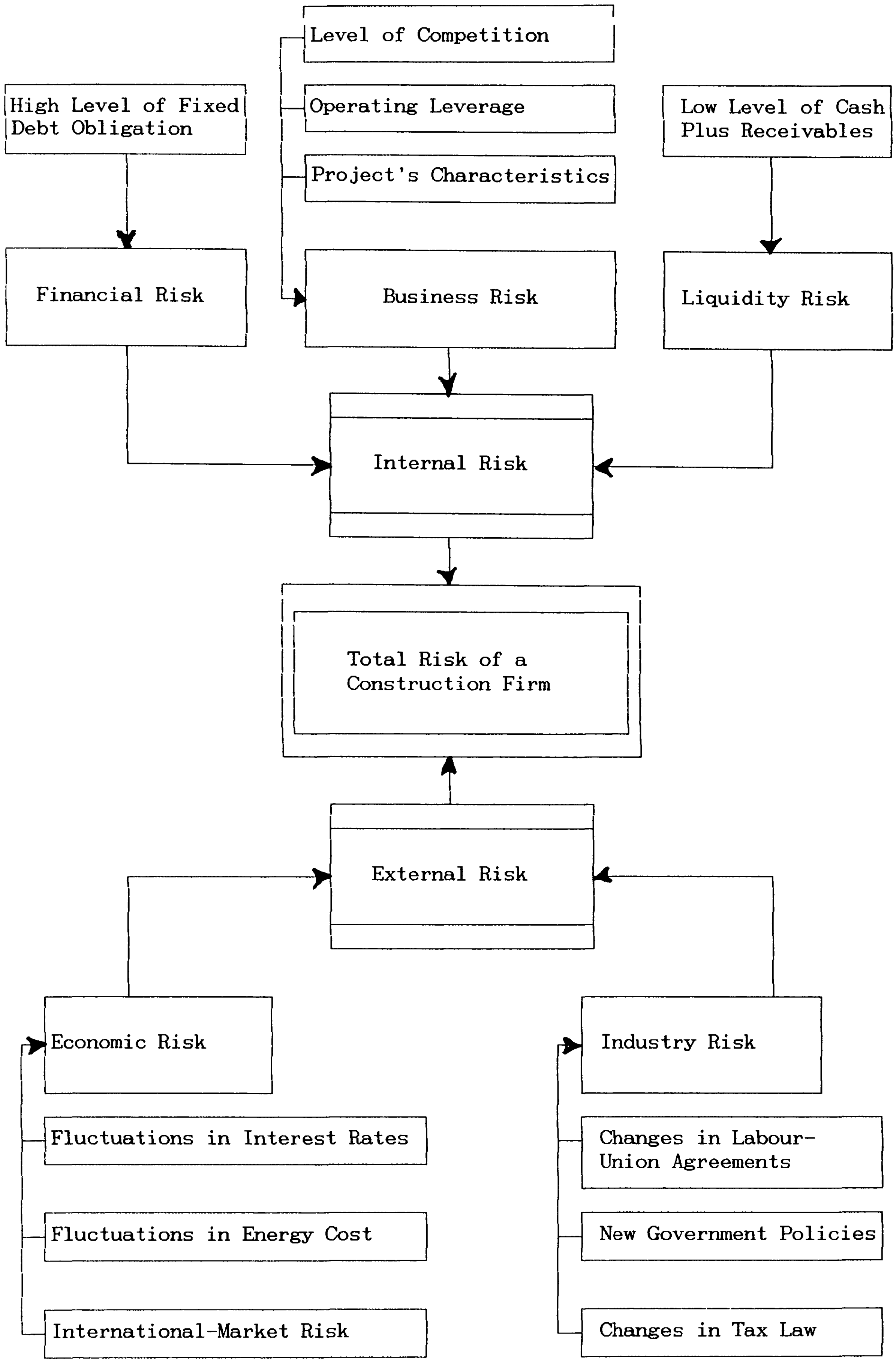
[7]The last thirty years have witnessed changes in the methods of procurement of large construction projects both in Britain and in the developing such as Ghana. Some of these changes have filtered through as a follow up from past colonial influences - the procurement system in Ghana follows the British pattern; expatriate firms contracted to work have used forms of procurement pertaining in their home countries and in this way have been agents of change. Funding agencies and financiers of development projects, in an effort to ensure that their projects achieve the intended socio-economic benefits for which they were initiated, have also introduced changes in their procurement system to ensure that performance targets are met.



Risk Components of a Construction Firm

Source: Kangari, R., and Fardi, F., "Construction Risk Management"

Fig 5.1

Where risks are allocated to the party that can better manage those particular risks, the contract is better run. The risks that should be carried by a contractor are those which he can assess better than the client. Assessing a risk means both constraining its impact and forecasting the consequences of its impact. For example, this answer leads to allocating the risk of bad weather to the contractor. He knows more than the client about how to protect construction activities from bad weather and more about the likely cost of bad weather effects against which he cannot protect. Another example is the risk of inflation. As neither the contractor nor the client can control the rate of inflation and neither is likely to be better than the other at forecasting what it will be, this risk is often placed with the client.

Another principle of risk allocation concerns the sizes of individual risks and the size of the resulting total risk carried by each party. In practice this means that the size of the total risk is heavily influenced by the size of the single largest risk and totally dominated by the size of the small group comprising the larger risks. If the largest risk can be shrunk or removed, it has a major beneficial effect. For example, this phenomenon makes it possible for the client to actually save money by doing some extra site investigation before inviting tenders for a tunnelling contract. This shrinks the largest single risk, that of encountering unforeseen ground conditions.

A method of limiting an individual risk is to specify in the contract that it is to be carried by the contractor within a stated limit and by the client if it goes beyond the limit. Unforeseen ground conditions in the UK contracts are usually of this type.

Contractor reputation affects the principle of risk allocation. In many countries, such as Japan, it is the culture that repeat business for contractors depends upon treating the current client well. Contractors may be motivated to absorb risks which the contract says they need not. Their reputation with the client is heightened or sustained so that the chance of getting further work from the same client is increased.

As projects differ from each other in terms of site, size and other characteristics, it follows that the appropriateness of each standard form of contract cannot be considered entirely in general terms. Its appropriateness must be considered in the light of the magnitude of the risks in the case of each project to which the contract might be applied. In Britain the newer forms of contract such as Management Contracting and Construction Management remove the risks normally carried by the contractor onto the client and the trade contractors. This form has proved successful for large projects, where risks have been significantly shrunk under a competent management contractor. Though Management Contracting is a relatively new form of contract in Ghana, it is proving successful for the projects for which it is being used. It is appropriate for projects of a speculative nature.

Design and Build contracts are best suited for functional projects where quality is of high importance, but not to the neglect of time. Turnkey contracts are appropriate for one-off projects such as power stations, dams etc. The ambiguities that gave rise to adversarial attitudes within the traditional standard form of contract have not been altogether eliminated with these forms of contract described above.
The New Engineering Contract is set out to address these problems.[8]

5.2 IMPLICATIONS

Construction projects with large overruns of time and cost limits fall short of expectations and have no place in the economies of the world today. Finance for large projects is often tied to high interest payments, and therefore the realization period is very crucial to investors and clients.

In Britain, if contract time and budget are overrun, the repercussions are enormous for the client or investor, who has to commence repaying his loans before he receives any income from his project. The users of the facility might not be as badly affected. If the client can prove it, he can claim damages from the contractor, but this is often not easy to do, and leads to long drawn out litigation.
In Ghana and the LDC's, time and budget overruns affect not only the client (often the government or the donor organization) and the investors (funding agencies or commercial institutions) but the users of the facility as well[9]. Most of these projects are tied into developing plans for the society and even the whole economy as a whole, and the repercussions are enormous. Governments have been known to stop work on projects which have far exceeded their budgets, thus denying the economy of some essential part of development. Thus the users who are not party to the contracts end up absorbing most of the risks.
Yet the success or failure of the economies of the developing countries is inextricably linked to the perception of their performance by the large international banks, and therefore it is imperative that construction projects, which use up a large part of any finance meet their expectations with regard to budget. The constantly changing rate of inflation means that projects must be completed in the shortest possible time.

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[8]It has been drafted on the basic and universal principles of risk allocation and is in a simple language which lends itself unambiguous translation. It accommodates all the types of contract currently available and seems to provide solutions of some troubling issues for both foreign and local projects.

[9]See Chapter 4.

Forms of contract which lead to shortcomings in the performance of the contract works involve unfair conditions of contract where the dominant power lays down principles which place excessive risks on the other parties. The contract then proceeds in an adversarial mode to the detriment of the whole project. It is in the best interest of the parties to the contract, as well as the users of the facility, and the financiers of the project to ensure that the contract proceeds as smoothly as possible.
This means that all the parties concerned must be aware of any issues which might affect their part of the contract, and should be prepared to tackle these in an efficient and professional way.

The following section gives guidelines, based on the allocation of risks, which will lead to better contract procedures.
This is of growing importance in Britain, the USA and in other European countries where it is proving successful. If it is applied in all contracts used in the developing countries, more of the large construction projects (as well as small ones) will show a track record of success than at present.

5.3 PROPOSALS

Division of Large Projects into Smaller Separate Projects:

For developing countries large projects could be divided into separate smaller projects which can be realistically completed within the set time, and well managed with regards to cost and quality. This will reduce risk of overrun of clients funds, effects of inflation, and, reduce the risk of projects being uncompleted.

Identification of Responsibilities:

To reduce the incidence of problems of time, cost and quality inefficiencies arising out of large construction projects, and possibly to eliminate them entirely, a thorough examination must be made of responsibilities of the parties within the contract. The responsibilities of each party must be written into the contract documents, and clearly set out. Rewards for good performance, and penalties for breach of contract should also be set out and implemented.

Appointment of Efficient Project Management Team:

At the time of project initiation, the project management team must be appointed, and be given ample time and resources to establish an organization and to plan the project.

In this early phase a risk analysis covering various aspects of the project should be performed. At this point uncertainties concerning the project management and organization should also be addressed and the impact that these factors might have on the budget, schedule and quality of the project.

The risk analysis must also take into consideration unavoidable real life problems and possible shortcomings on the part of the management team and evaluate ways of minimizing the effects of these shortcomings. A project team, like an iceberg, could have beneath the surface a large area of negative attitudes which may jeopardize the outcome of the project, (see fig. 5.2) and these should be identified.

Appointment of Contractors on Merit:

The design team must be appointed based on past performance and current capability. Too often, especially in LDC's such as Ghana, some construction contracts have been awarded for purely political reasons with little regard for past performance or capability of the contractor. This leads to substandard projects with substantial time and cost overruns and very often no chance to seek redress from the contractor. The system of checking out the contractor's bona fides and records used sometimes in Britain and to a lesser degree in Ghana, should be mandatory for all large construction projects.

The funding agencies such as the ADB, the ODA and the World Bank make it a point to appoint foreign contractors based on performance, and this should be extended to local contractors as well.

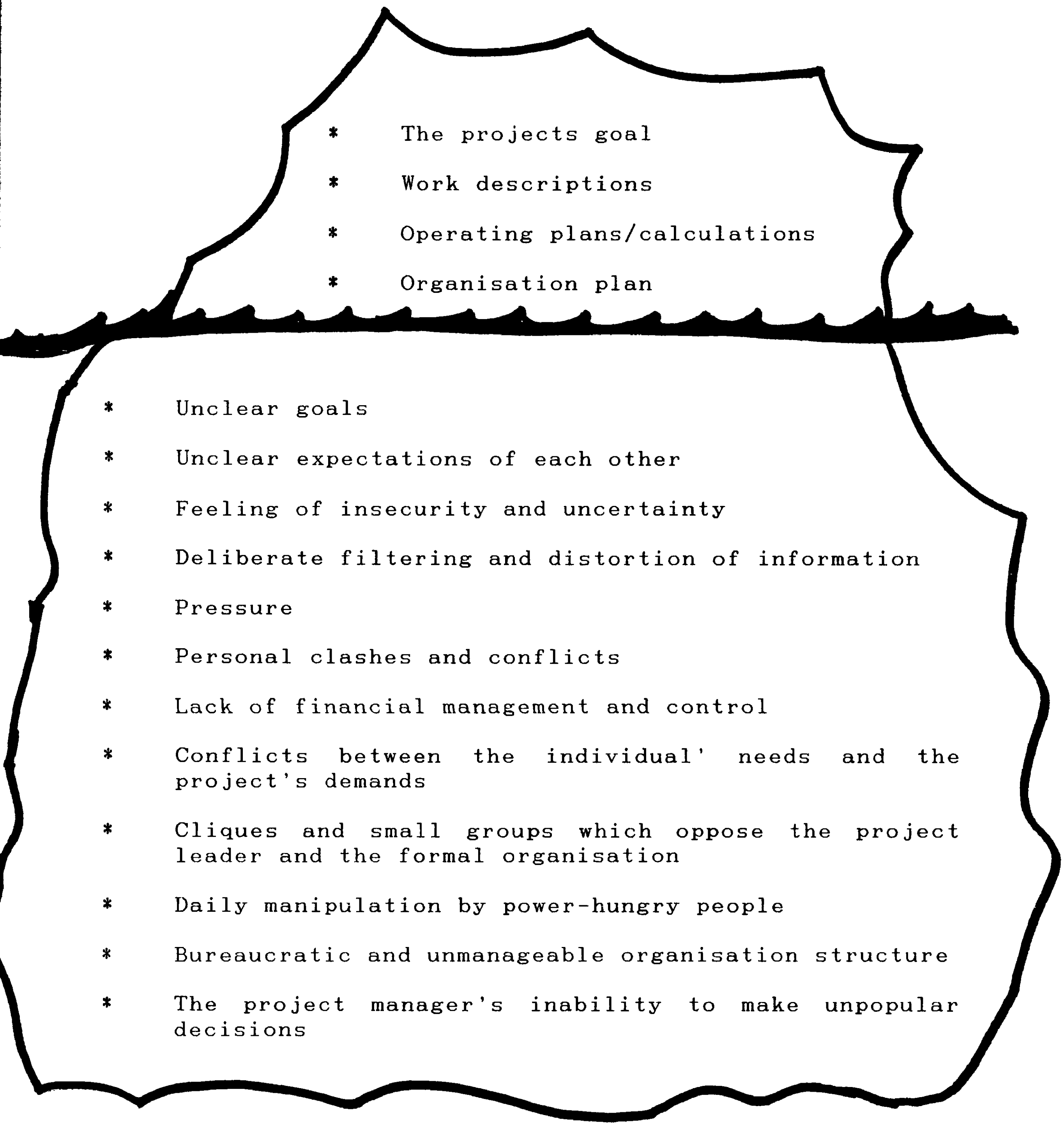
Risk Management Based on Risk Analyses:

A thorough risk analyses should be carried out to give the basis for risk management. (See example in appendix.)

Risk identification is the first stage. This is simply the catalogue of risks that may befall the project. Too often this is performed by one or a few of the project personnel. Risk identification is the responsibility of the entire project team. Competent risk identification relies on historical information, formalized checklists of risks and the collective experience of the project personnel. The project team should have several opportunities to brainstorm the entire project and discuss the risk items identified by the individual participants. This will help insure that all risks have been identified, defined and interrelated.

The second is evaluation or measurement of identified risks in terms of potential cost should the risk become an event.

Potential losses are associated with each risk expressed as a time, resource or monetary loss. This is a difficult process because (1) for each individual risk there is a broad range of potential loss; (2) some risks, particularly some of known unknowns and all the unknown unknowns defy definition in terms of potential for loss, and (3) the number of combinations that the risks can create losses is infinite.



The project organisation's iceberg.

Source: Schjetlein, I.O., (1990)

Fig 5.2

Research shows that people often underestimate uncertainty and overestimate the precision of their own knowledge and judgment. Thus, 'gut feel', single-number judgments in estimating potential losses can be dangerous, particularly when evaluating the combined effect of a number of variable items.

A number of methods are available for handling risk and uncertainty, these may be catalogued as follows:

Traditional: the use of allowances based on past experiences.
Simulation: an example of which is known as the Monte Carlo method, uses the computer to predict the possible range of outcomes for the project. See page A/1 appendix.
Analytic: the use of mathematics of probability to assess and combine the effects of the individual risk events into an overall measure of risk. See page in the appendix.
Discrete Event: use of decision trees, influence diagrams and utility theory.

Risk Control, the third stage is achieved by advanced planning actions and by risk containment actions.

Examples of advance planning action are risk avoidance; risk reduction; risk transfer; insurance; risk acceptance with contingency and risk acceptance without contingency.

Risk containment actions recognize that the losses assumed are not inevitable and could be either greater or smaller, and could be contained by management. Effective risk containment may convert some or all of the contingency set aside to additional profit by use of methods such as contingency planning; Pareto's law control; training programmes, rehearsals, labour agreement; and crisis management. This list is by no means exhaustive.

Throughout the life of the project, risk exposures should be re-evaluated so that timely control action can be taken and management action focused as necessary.

Assessment for Fitness for Purpose:

Incentives must be given for performance targets of projects during post evaluation period. Incentives for good operational management of staff should also be given by the clients organisation so that staff are more interested in making sure that the project is well run. Renewal contracts should be awarded to teams who show sensitivity in providing a project that will suit the users.

MONTE CARLO TECHNIQUE

The Monte Carlo technique uses a statistical model that may be applied to events where the outcome of each event can occur over a range represented by a frequency curve. Figure 1 is an example of such a curve for work-hours required to complete a typical task, the data representing a large number of possibilities. The Monte Carlo technique is useful for evaluating the combined potential of multiple, independent variables such as this one.

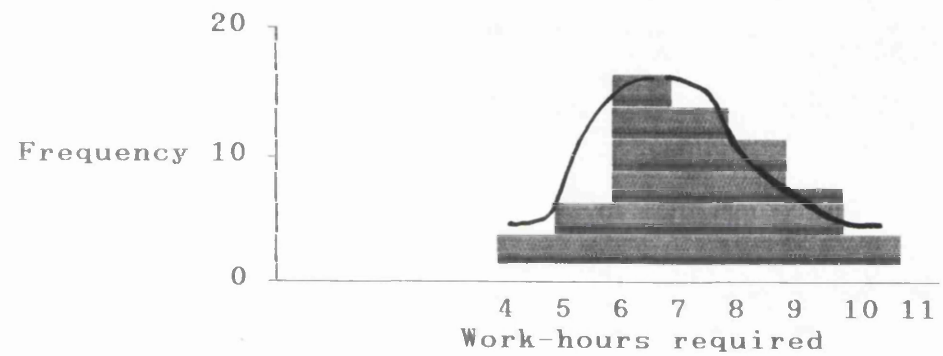


Figure 1. Frequency Curve

Identifying the Critical Cost Elements

The Monte Carlo technique is applied in the following manner. First, the critical cost elements in the project are identified. The typical project has numerous cost elements, but Pareto's Law (the law of "the significant few and the insignificant many") tells us that only a few are critical. It is this phenomenon that both causes the problem and allows us to solve it. Since only a few critical elements exists, it is quite possible that a majority of them will go in the wrong direction and thus lead to a cost overrun on the project. ON the other hand, their small number allows us to concentrate on them to better understand how the project is likely to unfold. Which cost elements, then, are critical?

We first must decide what is critical as far as the bottom line cost is concerned. Specifically, what maximum variation in bottom line cost, caused by a variation in *single* cost element, are we willing to tolerate? One rule-of-thumb* places this threshold in the neighbourhood of 0.5 percent in conceptual cost estimates and 0.2 percent in detailed cost estimates. Using this rule, if the target bottom line of a project in a conceptual cost estimate is $1,000,000, then the threshold is $5,000.

The critical cost elements in the project now can be identified. Specifically, a critical cost element is one whose value can *vary* from its target estimate, *either* favourably or unfavourably, by such a magnitude that the bottom line cost of the project would change by an amount greater than the threshold. Thus, in the

APPENDIX

previous example of a $1,000,000 conceptual cost estimate, any cost element in the project which can change the bottom line cost, either favourably or unfavourably, by more than $5,000 is classified as a critical cost element.

This rule-of-thumb has been successfully applied in thousands of projects of all types ranging in size from $1,000,000 to $12 billion. Well over 90 percent of those projects had fewer than thirty critical cost elements.

It is important to note that the deciding factor in determining criticality is the potential for variation, not the magnitude, of a cost element. For example, a cost element may account for a large portion of the bottom line cost of the project, but may have little or no potential for variation. In other words, the actual value of the element cannot be sufficiently different than its target, either favourably or unfavourably, to produce a bottom line change which is greater than the threshold. Such an element is noncritical. On the other hand, another cost element (at its target) may account for a small portion of the bottom line but can vary from its target, either favourably or unfavourably, by such a degree that the bottom line change would be greater than the threshold. A cost element such as this is critical.

Potentially critical cost elements include liquidated damages for delay in completion and/or incentives for early completion, uninsured losses, costs of various major labour-intensive work activities, costs of major bulk commodities and overhead items.

Variability Ranges for the Critical Cost Elements

Once the critical cost elements are identified, the potential variability of each must be determined. This simply means that, in addition to its target estimate, each critical element is assessed in terms of its lowest and highest potential values. These lowest and highest estimates are far enough from the target estimate such that there is less than a 1 percent chance that the actual will be lower than the lowest estimate and less than a 1 percent chance that it will be higher than the highest estimate.

For example, assume that a critical cost element has a target estimate of $100,000. The project planners believe there is less than a 1 percent chance the actual cost will be lower than $80,000. They also believe there is less than a 1 percent chance the actual cost will be higher than $130,000.

It is important to recognize that the range is nothing more than a contingency for a given critical cost element - a contingency which considers potential underruns as well as potential overruns.

Handling the Noncritical Cost Elements

Once the critical cost elements in a given category (labour, for example) have been identified, the sum of their target estimates is subtracted from the total target estimate for the category. This difference, of course, is the sum of the target estimates of the noncritical cost elements in that category. In other words, the sum of the target estimates of the noncritical cost elements is "backed out" of the traditional estimate. The noncritical cost elements in that category are "frozen" at this figure for the Monte Carlo simulation.

Grouping all noncritical cost elements of a category into one figure is justified. Remembering that not one of these elements can vary the bottom line by more than the threshold value and that there are numerous noncritical cost elements, their behaviour as a group is predictable. there is a cancelling effect - for each noncritical cost element in that category that overruns we can expect another noncritical cost element in that category to underrun such that the total dollars of overrun is essentially offset by the total dollars of underrun. In other words, there is a "wash" in the noncritical cost elements in that category. There will be no cancelling effect if most of the noncritical cost elements' targets are optimistic or if most of them are pessimistic. In such cases, the bias should be compensated for by freezing the total of the noncritical cost elements at a value either higher or lower than their collective target estimate for the category. Or, if sufficient uncertainty exists regarding the degree of the bias, the *total* cost of the noncritical cost elements for that category should be assessed with a range.

Once all critical elements are ranged and noncritical cost elements frozen or ranged as a group, the Monte Carlo method is employed, typically on a computer. This results in a frequency distribution curve for the project similar to that for the individual work item shown in Figure 1. From this is developed a *cumulative probability curve*, also called the *Overrun Profile*. It displays potential project cost versus probability of that cost being overrun. Usually 1,000 or more simulations are performed to develop the overrun profile.

Figure 2 is a simple example of an overrun profile as might be generated using the Monte Carlo technique. This profile is an excellent tool for project managers to use in evaluating exposure. For example, it can be seen that there is about a 20 percent probability that the project cost will exceed $21 million. The 50 percent point is about $19.75 million.

In each of the methods described, the analysts are required to establish at least the high, low and target estimate for each critical cost element. In the more sophisticated Monte Carlo methods, the analysts also either select the probability of the target estimate not being exceeded, or more completely define the variation. Subjective judgments are required to establish these figures. It is better if these are arrived at through group brainstorming rather than leaving the process to a single individual as this will broaden the base of experience and knowledge applied to the process and eliminate individual biases.

Not all cost risk items are included in the ranging process, or a least their full potential cost is not considered. For example, many of the risks are insurable and protection is best provided with insurance. Usually, this insurance has a deductible portion so range values are found by multiplying the deductible amount by the estimated high, low and target frequency of occurrence. Of course, the cost of the insurance becomes a fixed-cost item in the contract.

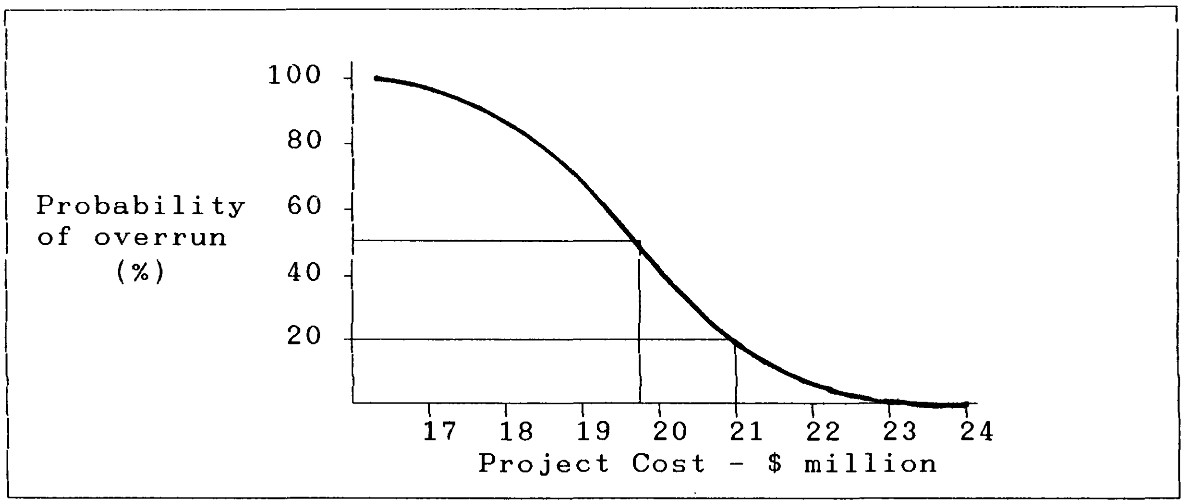


Figure 2. Overrun Profile

Selecting Method

Monte Carlo methods comprise only one of several techniques available to accomplish risk analysis. Selection of an appropriate technique for a given project is a function of several factors. Project characteristics which affect the selection of a risk measurement technique are:

how seriously the risk is viewed by management

the complexity of the risk environment

the expertise which is available to perform the risk analysis

Also, when selecting a risk measurement technique, one must consider that some techniques require more input data. Some give more appropriate output. Some are better at modelling highly complex risks and others are more appropriate for simple circumstances. On the basis of actual usage, however, the traditional and simulation methods have become the most accepted.

Schedule Risk

Time as well as cost is subject to variability, which should be considered within the risk management program of the project. as with cost, both the traditional and simulation approaches can be applied to schedule risk. A number of commercial software programs are available for the simulation approach; of course, the traditional approach uses a brainstorming approach for determining the potential for overrun of the schedule.

EXAMPLE RISK MANAGEMENT PROGRAM

Source:-

Introduction

The risk challenge and a general methodology outlined for managing risk has been previously described. In this example, a model risk management program for a management contractor bidding on a fixed-price engineering-procurement-construction project will be developed using the methodology described.

The Project

The project is a power generating plant to be constructed in a large area in country x in which a new residential area has been developed. Development consists of numerous housing estates, recreation area, private homes, a shopping centre, market and schools. The new plant is to support requirements associated with resort expansion that is to take place during the next several years.

The time is August 1 and requests for fixed-price proposals for the project have been issued by the utility concerned to selected contractors. As one of those contractors, we are evaluating the risk aspects of this project for purposes of determining whether we should bid on the project and, if we choose to bid, what our risk management plan will be.

The following additional details apply to the project:

- A major railroad passes through the town at the base of the valley.

- The estimated cost of $25 million is based on a similar unit built recently in another location.

- At this time the economy is sluggish, still suffering somewhat from the collapse of oil prices.

- The utility company has a contract for supply of natural gas upon completion of the project. Construction of the supply line is not part of this contract.

- The electrical distribution system outside the boundaries of the power plant is not part of this contract.

- It is expected that all permits will be available by December 1, the award date. However, the design-construction contract will not be awarded before all permits are approved. Thus, the utility requires that all bids be valid until March 1 with no adjustment of completion date.

- The selected contractor can choose to perform all engineering, procurement and construction functions using in-house resources, or may choose to subcontract any portion thereof. However, there will be a single contract for all functions between the utility and the contractor.

- Performance of the complete facility must be guaranteed.

- Required completion date is November 1, two years hence. Since the facility is needed to support new development operations beginning with the winter season following completion, there will be liquidated damages of $10,000 per day for all unrecognized delays after that date.

- The contract will include a limited hold-harmless clause to protect the utility from all acts performed by the contractor or his subcontractors and vendors.

- Neither construction traffic nor construction activity is permitted within the boundaries of the development before 7AM or after 7PM of any day. Further, no construction traffic or construction activity is permitted on Sundays.

Risk Management Program Approach:

Reflecting earlier discussions, the risk management programm will be developed in these steps:

Identified risks

Determination of options for handling risks

Measurement of risks to be covered by contingency

Determination of contingency

Summarizing overall risk management program

The objective of this example is simply to illustrate the methodology.

Risk Identification

This is a fixed-price, design-build project. Generally, design-build projects are either totally cost reimbursable or handled in a two-step fashion with the design being reimbursable and the construction cost fixed through negotiation after design definition is at a certain point. However, the facility involved is of a type for which there is considerable industry experience so a fixed-price approach can be considered. Even so, this feature of the contract is certainly a major risk item. However, for purposes of management we will break it into its components.

Recalling that risks can be classified as knowns, known-unknowns and unknown-unknowns, we first concern ourselves with the apparent known risks. From the information available and our general knowledge of construction, these known risks should be on our list:

Contract clauses
- Liquidated damages
- Performance guarantees

Time factors
- Available bidding time
- Available work days

Engineering factors
- Costs
- Quality of design
- Timeliness of design

Engineered equipment factors
- Cost
- Availability
- Inflation/escalation
- Ability to store and protect

Bulk and other materials
- Cost
- Availability
- Inflation/escalation
- Ability to store and protect

Area factors
- Remoteness
- Congestion
- Tourist/local population interferences
- Geology/subsurface conditions
- Transportation limitations; access/egress

Labour factors
- Uncertain availability; remoteness from population centres
- Uncertain quality
- Wage scales required to attract
- Possible substance abuse problems

Permanent material factors
- Costs; inflation/escalation
- Lead times for key items
- Ability to protect during winter

Ability to perform
- Availability of construction drawings when needed
- Qualified supervisory personnel
- Needed support facilities
- Conflict with other construction in area

Environmental
- Damage to natural features
- Damage to existing facilities (roads, bridges, etc)

Miscellaneous risks
- Delay in permit approval
- Insurable personnel and property losses
- Uninsurable personnel and property losses

Having compiled the list of significant known risks, the next step is to list the known-unknowns. The following items are the type that should be on that list:

Abnormal weather conditions
- Early winter or late spring
- Flooding
- Unusually heavy summer rain

Financial failure of key vendors or subcontractors

Violations resulting in stoppages or penalties

Strikes, embargoes, or other unexpected events elsewhere that affect equipment or materials availability

We cannot compile a list of unknown-unknown risks since these cannot be foreseen. However, we must still consider their potential for affecting the project and some protection will be included in the insurance portion of our risk management program.

Cataloguing Risks and Control Options

The development of the lists above has forced us to expose the included risks of this contract. The next step is to organize these for purposes of control since many of the risks are interrelated. For example, labour costs are a function of wage scales, crew compositions, productivity and extent of rework. Productivity will be a function of many factors including quality of the workers, management competence, congestion, quality and availability of design drawings, availability of materials and availability of tools and construction equipment. It would be impractical to evaluate each of these elements independently so we will combine their effects into major risk categories.

While the total risk list can be organized in a number of ways, we have chosen to consolidate them into the categories below. Also, for each selected category, we will list options available to us for control of that risk. Later, we will select from these options for our final program.

All risks
- Avoid by electing not to bid on this project

Engineering cost overruns

- Transfer risk by subcontracting engineering
- Accept risk without contingency
- Accept risk but include as contingency item
- Employ strong scope and change control program

Craft labour cost overruns

- Transfer risk by subcontracting some or all construction work
- Accept risk without contingency
- Accept risk but include as a contingency item
- Employ strong quality management program to control rework
- Use worker incentives to recognize superior quality and productivity

Engineered equipment cost overruns

- Accept risk without contingency
- Accept risk but include as a contingency item
- Use competitive bidding to minimize cost

Other materials cost overruns

- Accept risk without contingency
- Accept risk but include as a contingency item
- Utilize competitive bidding on supply contracts
- Utilize early buyout of selected materials to avoid later price increases

Schedule overruns and liquidated damages

- Transfer liquidated damages risk to vendors and subcontractors
- Accept risk without contingency
- Accept risk but include as contingency item in both schedule and budget
- Implement strong planning and control program to assure full integration of engineering, procurement and construction activity
- Integrate materials tracing with cost/ schedule control
- Use strong expediting program for critical purchases
- Have contingency plans for critical operations
- Include incentive features in procurement contracts for early delivery and zero defects

Personnel, equipment or constructed facility loss

- Purchase insurance required by law or owner
- For other insurable losses, accept risk and self-insure without contingency
- For other insurable losses, accept risk and self-insure with contingency
- Purchase available insurance for other insurable losses and accept risk of

uninsurable losses without contingency
- Purchase available insurance for other insurable losses and accept risk of uninsurable losses with contingency
- Utilize strong safety (loss control) program
- Develop emergency plans (accident, severe weather etc)

Performance guarantees
- Utilize comprehensive qualification program for vendors of all mechanical equipment
- Emphasize use of off-the-shelf, use-tested components instead of newly engineering items
- Transfer performance guarantees to vendors by contract

Special losses (fines, etc)
- Accept risk without contingency
- Accept risk but include as contingency item
- Utilize strong safety (loss control) program
- Develop environmental protection and other emergency plans

Other risks inherent in project
- Pareto's Law management (critical items management)
- Comprehensive quality management program
- Establish staging area outside resort complex to permit work during excluded hours
- Maintain zero tolerance substance abuse policy
- Establish close screening policy for all hires
- Provide training as necessary for selected supervisory and craft personnel

As is apparent from the above listing there are many actions in addition to buying insurance and establishing a contingency that can become elements of a risk management program.

To continue with the example, it will be assumed that we have decided to bid on this project and to perform all engineering, procurement and construction using in-house resources or through direct hire. Also, we will assume that the decision has been made to: (1) buy insurance for insurable risks at levels normally used by the company, and (2) establish contingencies for both cost and schedule for those risks for which contingency is a control option. Determination of the amount of cost contingency is the next major task. Later we will choose additional control options to round out our program.

Contingency Determination:

For those items for which setting aside a contingency amount is an option, we must follow a structured procedure to determine the collective amount. Two methods will be suggested. The first utilizes percentage markups (traditional method); the second is Monte Carlo, a special form of simulation.

For the percentage markup approach, we isolate each of the risk elements for which a contingency is to be a part of its risk control. Then, for each of these elements, we establish the target cost (conventional target estimate) and a percentagemarkup or a lump sum for contingency. This markup is established through brainstorming by the project team. For our example, the following risk elements were selected for contingency. The target estimates and markups for each are assumed to be as listed in Table 1.

Table 1
Contingency Markup

	(Cost in $000)		
	Target	Mark Up	Contingency
Engineering	800	15%	120
Craft Labour	6,500	20%	1,300
Engineered Equipment	6,000	10%	600
Bulk Materials	6,200	10%	600
Other Project Costs (overhead, etc.)	1,000	5%	50
Liquidated Damages	0	LS	110
TOTAL PROJECT LEVEL COST	20,500		2,800

Under this procedure our assumptions have yielded a contingency account of $2.8 million dollars.

The second procedure is Monte Carlo as described above. To apply this method we first analyze the risk and opportunity of each critical element selected for contingency coverage. This is best done by personnel most familiar with the item in question who collectively establish a low, target and high cost value - i.e., the range. For purposes of definition, the low value can be treated as a value below which there is less than 1 percent chance of occurrence. Similarly, the high value will have less than 1 percent chance of being exceeded. The target value is that which would be selected under conventional single-number estimating. The results of this brainstorming session for this example are assumed to produce the ranges in Table 2. To keep this example as simple as possible the total cost is summarised in the six categories listed. In practice, more could be used. For example, labour cost could be broken down into crafts and these individually ranged (if each is a critical cost element).

Table 2
Cost Ranges

	(Cost in $000)		
	Low	Target	High
Engineering	600	800	1,200
Craft Labour	4,800	6,500	11,000
Engineered Equipment	5,500	6,000	7,500
Bulk Materials	5,300	6,200	8,100
Other Project Costs (overhead, etc.)	900	1,000	1,100
Liquidated Damages	0	0	300
TOTAL PROJECT LEVEL COST	17,100	20,500	29,200

With the Monte Carlo program, only those cost elements which are critical are ranged. In a conceptual or approximate estimate such as this, a cost element is critical if its maximum potential overrun or its maximum potential underrun would change the total cost of the project by more than 0.5 percent of the targeted bottom line estimate (0.2 percent in the case of a detailed or definitive estimate).

Since the targeted bottom line estimate of this project is $20,500,000, a cost element is critical (and should be ranged) if it can cause a total cost overrun of more than $102,500 (0.5 percent of $20,500,000) or a total cost underrun of more than $102,500. The data in Table 2 indicate that five of the six cost elements are critical. "Other project costs (overhead, etc.)" is noncritical since the maximum potential change which it can effect on the total cost of the project is $100,000. For that reason, it will be renamed "Noncriticals" and frozen at $1,000,000.

If they wish to do so, the estimators and management may further refine each range to include the probability that the target estimate will not be exceeded. For this example, assume that the results are those shown in Table 3.

Table 3
Cost Ranges and Probabilities

	(Cost in $000)			
	Low	Target	High	Prob.*
Engineering	600	800	1,200	50%
Craft Labour	4,800	6,500	11,000	40%
Engineering Equipment	5,500	6,000	7,500	50%
Bulk Materials	5,300	6,200	8,100	30%
Liquidated Damages	0	0	300	
Noncriticals		1,000		

TOTAL PROJECT LEVEL COST		20,500	(*of not over-running target)	

Next, the Monte Carlo program is applied. This program costs the project 1,000 times on a computer to develop the overrun profile. For this example the results are displayed in Figure 3.

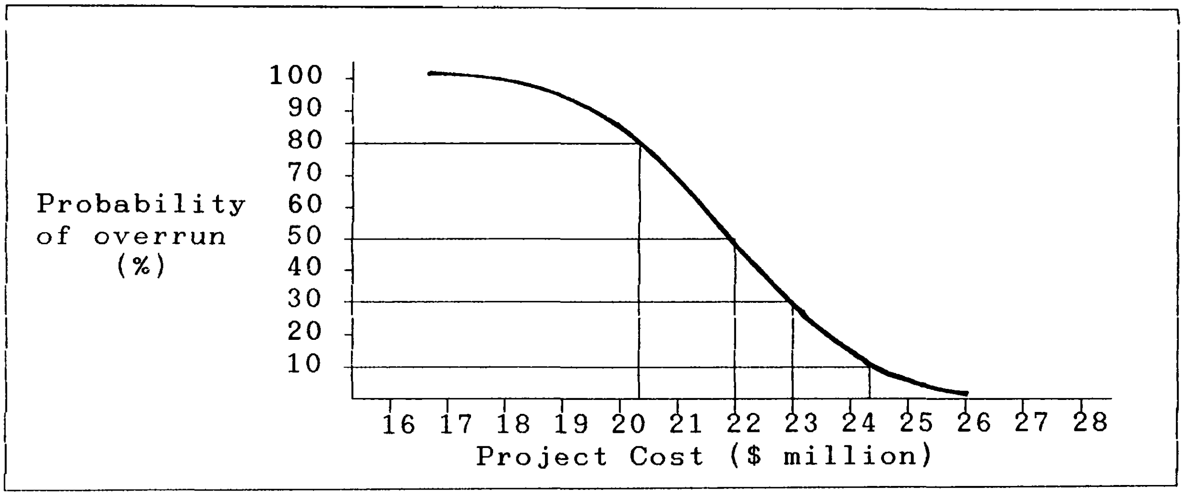


Figure 3. Overrun Profile

Note that the possible project costs are within the low and high extremes indicated in Table 2. Also, note that the target cost has an 80 percent probability of being overrun. This is a consequence of the fact that we foresee more potential for overrun both in amount and probability in the critical elements than we do for underrun. The 50 percent point is about $22 million.

Close review of this process and the resultant overrun profile reveals how we are combining both cost and contingency determination. We can also add our profit into the picture. Assume we decide to operate at the 70 percent level of confidence of not having a cost overrun (i.e., a 30 percent chance of having an overrun). In this example, that project cost is about $23 million. If we wish to add our profit - say $1.5 million - our price to the owner would be $24.5 million. We can then be 90 percent confident of not losing money since Figure 3 indicates there is only a 10 percent chance of overrunning $24.5 million.

The Final Risk Management Plan

Having selected contingency, we complete our risk management plan by additionally selecting other risk control options from those available. Figure 4 is a spreadsheet representing the complete program for this project.

The Schedule Risk Management Plan:

To this point all attention has been focused on items affecting cost. Schedule performance certainly affects costs and certain of the selected control actions in our Risk Management Plan simultaneously control both cost and schedule. Thus, it is recommended that contingency time be included in time planning. The owner's need date is fixed so all contingency time must be incorporated prior to that time. Total contingency time can be determined by using either a traditional or simulation approach. This time should then be distributed among phases of the project based on a weighting system which considers the relative time risks among phases.

Managing Contingency:

It is recommended that the contingency set aside of the project be managed in a fashion that reflects the way it was determined. In this example, five accounts were critical and ranged. Thus, the contingency should be allocated to those five for purposes of control. For a ranged account, the allocation should be based on the bottom line effect of its maximum potential overrun weighted by the probability of it overrunning, offset by the bottom line effect of its maximum potential underrun weighted by the probability of it underrunning.

In this example, assume we wish to operate at a confidence level of 70 percent. This means we will set aside a contingency of $2.5 million ($23.0 - $20.5). The allocation of this $2.5 million is shown in Table 4.

Table 4
Contingency Allocation

(a)	(b) Max O'run	(c) Prob O'run	(d) (b)x(c)	(e) Max U'run	(f) Prob U'run	(g) (e)x(f)	(h) (d)-(g)	(i) (h)/39.8	(j) Allocate (i)x2500
Engineering	400	50%	200	200	50%	100	100	2.5%	62.5
Craft Labour	4,500	60%	2,700	1,700	40%	680	2,020	50.8%	1,270.0
Engineered Equip	1,500	50%	750	500	50%	250	500	12.6%	315.0
Bulk Materials	1,900	70%	1,330	900	30%	270	1,060	26.6%	665.0
Liquidated Damage	300	100%	300	0	0%	0	300	7.5%	187.5
Noncriticals	0	0%	0	0	0%	0	0	0.0%	0.0
Total Project Level							3,980	100.0%	2,500.0

A Word about Risks and Contingencies

Referring to Table 4, columns "(d)" and "(g)" are, respectively, excellent measures of the major risks and opportunities in this sample project. The values in these columns are used to construct a *Risk/Opportunity Profile* as shown in Figure 5. This particular report is an excellent example of how the Monte Carlo approach capitalises on Pareto's Law and the management by exception principle to assist engineers and managers in decision-making.

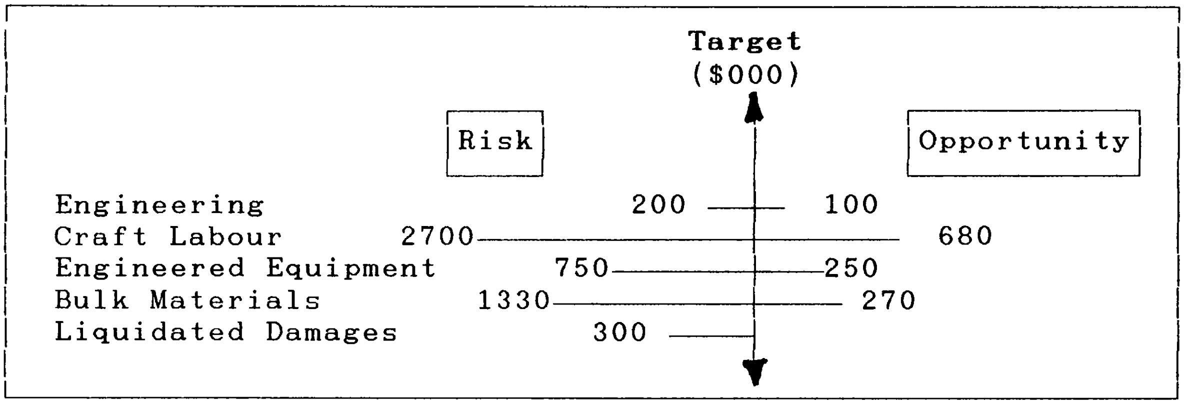


Figure 5. Risk/Opportunity Profile

THE NEW ENGINEERING CONTRACT

The ICE say the New Engineering Contract is applicable to building work as well as to civil engineering and that it can be used for large scale operations right down to small projects. Fundamental to the concept is applied collaborative management and the Project Manager features prominently. His role is to act primarily in the interests of the Employer. There is no mention of an architect, quantity surveyor or even an engineer, and the traditional notion of a professional acting fairly as between the parties is not evident.

The idea of one basic form of contract which can be adapted for use with traditional lump sum contracts, target contracts, cost reimbursement contracts or management contracts is appealing. Furthermore, it is claimed that design responsibility by the main contractor to varying degrees can be introduced as required. The flexibility is achieved by taking core clauses common to all contract types, and adding option clauses. Thus a typical NEC contract might include the following:

Form of Tender (a standard printed form)

Schedule of Contract Data (to accompany the tender). Part one contains information to be provided by the Employer about matters which might have tendering implications. Part two is to be completed by the Contractor and submitted when tendering. It contains information about proposed site working and relevant detail on rates and prices.

The Core Clauses These are set out in nine sections and will apply to all contracts. The use of plain wording in relatively short clauses is attractive as an aid to clarity. Unfortunately for architects well versed in traditional forms of contract, the precise meaning of some unfamiliar terms and phrases which have been introduced rather reduced the clarity and, of course, there is no case law yet to help.

Main Option Clauses These are offered as six sets of clauses A to F, and one set will be added to the Core Clauses to adapt the document for the type of contract required. (ie Conventional with Quantities or Activity Schedule; Cost Reimbursable Contract; Management Contract etc).

Secondary Option Clauses These may be incorporated or not as required and some can only be used in conjunction with certain Main Options. There are thirteen headings in all (G to U) and by using them fluctuations, delay damages, low performance damages, early completion bonus, sectional completion, performance bond, contractor's design liability, etc can be made part of the contract.

The ICE say that NEC is drafted as a main contract, but that it could equally well serve as a subcontract, plus providing the main contractor with back to back protection. Nevertheless there is no facility for nominating subcontractors. It is claimed by the ICE that the form is designed to stimulate good management and to reduce risk. Emphasis is laid on the contractual importance of programming, management meetings, early warnings by both Project Manager and Contractor in order that matters which have implications for progress and additional costs can be considered early.

Architects attracted to the form will soon appreciate that it will not be simple to use. It takes a completely non-traditional approach and it calls for a considerable reappraisal of the information to be supplied in regard to works information.

The document is at present still in draft for consultation. It is understood that the ICE intend to complete final drafting with a view to publication by the end of 1991 and hopes to obtain the benefit of views from firms who will have used it experimentally. The RIBA Contracts Committee is actively studying the draft, and whilst at present it is difficult to see this as a serious competitor to the more traditional forms of building contract, undeniably it is a bold step forward from which a lot can be learned. It should certainly stimulate our thinking about current needs and future directions.

(RIBA Practice September 1991. Issue 78.)

DEVELOPMENT OF THE PROCUREMENT SYSTEM IN BRITAIN

The organisation of the building industry into general building firms, contracting or speculative , and specialist firms is comparatively modern. Traditionally, skilled craftsmen assisted byu labourers and apprentices carried out the separate processes in the erection of buildings. During the Middle Ages and until about the middle of the eighteenth century, the building owner or his architect or agent, employed each craft directly through the master craftsmen who were the employers in each craft. It was not unusual for the designer or architect to combine the functions of contractor and designer, including as part of his reward any profits or losses he might make as a result of his responsibilities for actual provision of material and labour, and their supervision. Christopher Wren, for instance, acted in this way in the building of St. Pauls's. It is not really known how early or how often a master craftsman in some trade undertook the work of co-ordination between crafts , and/or the financial risks involved in employing these crafts and organising supplies of materials. Speculative builders were notorious by the mid eighteenth century, and it was recorded in 1751 that master bricklayers were living handsomely as a result of acting as master builders who 'project, draw, plan and estimate for building'. General contractors are thought to have proceeded on the traditional lines arranging with individual master craftsmen or craftsmen for specific jobs. In 1815, Thomas Cubitt, the founder of the well known firm of Cubitts, introduced an innovation regarded at the time as very daring, though it became the general practice. Instead of arranging with craftsmen to carry out particular jobs, he started to employ them under craft foremen on an ordinary time basis to work on whatever jobs he had for them. It was partly to keep this body of workmen constantly employed that he started in the field of speculative building. By the 1830's there were very substantial building firms in London, with large contractors employing between 175-235 men. In 1834, the Builders Society, later the Institute of Builders, were founded, and the London Master Builders Association was founded five years later. Although the rise of the general builder speculative or otherwise, did not proceed without bitter opposition from the small master craftsmen, by the middle of the nineteenth century, it was evident that the general builder organising the complete job, either on contract or on a speculative basis, was well established in England.

EMERGENCE OF THE BUILDING PROFESSIONS

ARCHITECTS

The great efflorescene of building in Britain during the later seventeenth century and the eighteenth century created opportunities or architects. Architects concerned themselves with design and supervision only, delegating the organisation of the actual building process to others. By 1791, architects had become sufficiently self-conscious about their profession to form a club, and suggestions were mooted for the registration of architects. In response to the need for some organisation and more specialised education, the Architectural Society was formed in 1831. The Institute of British Architects, later the Royal Institute of British Architects (RIBA) was formed three years later; it received its charter in 1837. In 1887 the principle of separation between architects and builders was incorporated into the RIBA charter. This laid down inter alia that no member of the Institute could hold a profit-making position in the building industry and retain his membership. the RIBA, in 1909, agreed on an official policy of establishing a register of architects from which all members having an interest in building were to be excluded. This was successfully achieved when the Architects Registration Act was passed in 1931.

ENGINEERS

An obvious consequence of the above policy was that builders wishing to educate their sones to join the firm later on, trained them as engineers and no architects, as the engineering profession imposed no such obstacles on its members. In 1913, the Association of Consulting Engineers was founded. Although it forbid its members from having a pecuniary interest in a contracting firm, this was mainly to ensure that its members were independent consultants; it did not prevent professional engineers from being principals in a contracting firm.

Before the formal specialisation of professions there had been no hard and fast line between architects and engineers, any more than architects and builders. The increased use of iron and steel altered all this, such that by the nineteenth century, the innovations in structure and designs for novel and industrial buildings, tended to originate with engineers or builders rather than with architects. The importance in building of professional engineering had developed so far that by the beginning of this century, engineers could be found who did not hesitate to declare that there was no place architects in factory or workshop building for the engineering industry.

QUANTITY SURVEYORS

Originally, each building contractor tendering for a job drew up his own bills of quantities, employing a special estimator for the purpose. But in time builders tendering for large jobs realised that it would be more economical if they employed jointly one surveyor to draw up the bill of quantities on which each builder would price and tender separately. Precisely when this became general practice does not seem to be known, except that it was during the nineteenth century. In time, it became the custom for the quantity surveyor to be appointed and paid by the building owner. This relieve the builders of the expense and, at the same time provided the building owner with a surveyor to represent him in any later adjustments on the contract that might be required. The professional quantity surveyor employed by the building owner thus became an integral part of the general organisation, gradually building a position as an independent expert consulted in cases of dispute. The Royal Institution of Chartered Surveyors (RICS) was founded in 1868.

THE CONTRACTING SYSTEM

The relationship between building owners, the building professions and the builders (other than speculative builders) may be conveniently designated collectively as the system, which has a strong flavour of social class-distinctions. Within the general system it is possible to identify something that hs the atmosphere and mystique of the establishment, the version of the system approved by the architects, in which the architect was recognised as head of the hierarchy.

Among the number of important developments that took place in the organisation of the professions between the 1st and 2nd World Wars was the introduction of professional examinations by the various bodies. The most important new profession to emerge was the structural engineer, who had previously not been distinguished formally from the civil engineer. The interwar period was thus one of consolidation in the position of the main professions. The establishment of professional qualifications, and of a professional code of behaviour helped to achieve one of the main objectives of the founders of the professional bodies, that is the raising of the status of the professions. As long as everyone was prepared to conform to the system, preferably the establishment, relations between the individual members of the profession, clients and builders could be pleasant enough. The more fundamental question of whether the professional organisation which had developed during the previous century, was the most appropriate to the needs of a modern industrial society was not considered. The ordinary members of the building profession were necessarily concerned with earning their living, change was not their business.

DEVELOPMENT OF THE PROCUREMENT SYSTEM IN GHANA

The construction industry of Ghana today is organised along lines similar to the British construction industry largely as a result of colonization.

Traditionally, the procurement system was organised according to the methods of building in the area, which depended on the climate. Houses were constructed with the help of the family, with building materials obtained locally. In northern Ghana, building was a co-operative effort, with the men as builders and the women as decorators. The technology of building known to everybody, and therefore a farmer would not engage skilled craftsmen to build his house. In southern Ghana, the early trade with gold, diamonds, timber, later cocoa, different minerals, as well as agriculture brought in foreign influences - Islam, new towns by the European traders, and later the Christian missionary influence which introduced new styles and methods. In the transitional forest zones, houses were largely self built, or contracted out to migrant builders. Construction work in areas such as the Ashanti region, was carried out by skilled artisans under the supervision of master builders. Along the coast, the foreign traders built castles and forts to protect their interests and married into local merchant families, and built houses with imported building materials. (Schreckenbach, H. and

Abankwa, J. 1984). The procurement system uses in the foreign countries were modified into the existing traditional system, and the rise of the general builder or master builder overseeing the work of craftsmen or artisans grew. There had been, among Ghanaians, a preference for the older professions: law, medicine, teaching, nursing and the ministry, and there were only a few qualified Ghanaians in the building industry. In the run up to independence and after, the number of Ghanaian professionals increased set up their own firms (architectural, engineering, and surveying). Would be contractors, however, did not have the initial capital to set up contracting firms on their own, and they were not helped by the highly conservative banks. The field was therefore left open to speculators and businessment who were attracted by the large profits they hoped to make.

GLOSSARY OF TERMS

Accepted Risks The term used to describe the risks which may affect the works but which are outside the contractor's control.

Clause 1(2) of GC/Works/1, defines 'accepted risks' as fire or explosion; storm, lightning, tempest, flood or earthquake; aircraft or other aerial devices or objects dropped from them, including pressure waves caused by aircraft or such devices whether travelling at sonic or supersonic speeds; ionising radiations or contamination from radioactivity from any nuclear fuel or from nuclear waste from the combustion of nuclear fuel, radioactive, toxic, explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof; riot, civil commotion, civil war, rebellion, revolution, insurrection, military or usurped power or King's enemy risks.

Under clause 25(1) the contractor is under a duty to take all reasonable precautions to prevent loss or damage from any of the accepted risks and to minimize the amount of loss or damage so caused. Provided he does so the Authority pays for loss or damage so caused and the contractor is entitled to an extension of time under clause 28.

Act of God An archaic legal phrase meaning a sudden and inevitable occurrence caused by natural forces. The test is whether or not human foresight and prudence can reasonably recognize its possibility so as to guard against it (Greenock Corporation v. Caledonian Railway Co. (1917)). Lightning, earthquake (at least in the United Kingdom) and very extraordinary weather conditions come within the concept. An Act of God does not in itself excuse contractual performance, but it may do so on the true interpretation of the terms of the contract. Some insurance policies and contracts for the carriage of goods provide that there is no liability for losses caused by Act of God in the context of the construction industry, although some contractors may refer to it as an excuse for non-performance or a ground for terminating the contract. What they usually mean is the similar but wider concept of force majeure.

Adverse Weather Conditons

The changing nature of the weather has always been the enemy of building work which generally takes place exposed to the elements. At common law, bad weather as such does not excuse the contractor if he is delayed as a result (Maryon v. Carter (1830)).

Extraordinary weather 'such as could not reasonably be anticipated' may amount to an Act of God or *force majeure*.

The realities of the situation are recognised by most forms of contract which allow for bad weather to varying degrees and provide for an extension of time to be awarded under certain circumstances. JCT 80, clause 25.4.2 lists 'exceptionally adverse weather conditions' as a relevant event entitling the contractor to claim an extension of time. JCT 63, clause 23(b) refers to 'exceptionally inclement weather'. The change in wording makes clear that the new wording is intended to cover an exceptionally hot summer, which might well not be regarded as 'inclement weather', although excessive heat and drought can be just as damaging to progress as snow or frost.

Adverse weather conditions would embrace any weather conditions which were contrary to the ideal in any particular circumstance, and the contractor must be taken to have comtemplated the possibility of such weather as part of his contractual risk (Jackson v. Eastbourne Local Board (1885)). The qualifying word 'exceptionally' is, therefore, of the utmost importance.

In order to show that weather conditions were *exceptionally* adverse, the contractor may have to provide meteorological records for a lengthy period - 10 or 20 years - to show that the weather was 'exceptional' for the area. It is the kind of weather which may be expected at the particular site which is important at the particular time when the delay occurs.

Thus, in most areas of England and Wales snow is not exceptional in January, but it gw in July. In some areas, however, and at some altitudes, snow would not necessarily be exceptional in early summer. Even if the weather conditions are exceptional, they may not necessarily be 'adverse' because the weather must interfere with the works at the particular stage when the exceptionally adverse weather occurs. This depends on the stage of the construction work at the particular time. If some internal works can continue, for example, the contractor would generally have no valid claim.

The contractor is expected to allow in his tender and his programme for anticipated weather conditions in the area, having regard to historical data, the time of year and location of the site. This allowance is or should be reflected in the tender price. Often the situation is not clear-cut and, for example, some work may continue on internal fittings at the same time as external work is delayed due to exceptionally adverse weather conditions. In such cases, the architect must enquire carefully into the contractor's master programme before reaching a decision.

GC/Works/1, clause 28(2)(b) allows 'weather conditions which make continuance of the work impracticable' as a circumstance entitling the contractor to claim an extension of time. At first sight the provision appears wider than its JCT 80 equivalent in the sense that it covers any situation where the weather conditions seriously interfere with the carrying out of the work. The conditions need not be 'exceptional', i.e., unusual, nor need they be 'adverse' in the sense of 'contrary' or 'hostile'; but the keyword is 'impracticable', i.e., incapable of being carried out, which means in effect that the weather must interfere with the work at the stage it has reached and make it infeasible to proceed. However, it seems that it is irrelevant whether or not the contractor could have foreseen the possibility of delay from such a cause.

GC/Works/1, clause 23 empowers the superintending officer to order suspension of the work or any part of the work to avoid the risk of damage from frost or inclement weather. In such circumstances the contractor may be entitled to make a financial claim.

ACA 2 makes no specific references to the weather. However, clause 11.5 (alternative 2) allows *force majeure* as a basis for a claim for extension of the time and wholly exceptional and unanticipated weather conditions, e.g., extraordinary rainfall, extraordinary snow, etc., could qualify under this head. This is not, however, as wide as under JCT 80 or GC/Works/1.

Agreement for Minor Building Works

The JCT Agreement for Minor Building works was first published in June 1968, reprinted with minor amendments in October 1981. Practice Note M2, issued in August 1981, says that it is designed for use where minor building works are to be carried out for an agreed lump sum and where an architect or supervising officer has been appointed on behalf of the employer. It is for use where a lump sum offer has been obtained based on drawings and/or specifications and/or schedules but without detailed measurements. It is suggested that the form is generally suitable for projects up to a value of £50,000 at 1981 prices. Contract value is not, however, the deciding factor which is probably the complexity of the job rather than its value.

The form should *not* be used where any of the following are required:
- Nominated sub-contractors or suppliers
- Bills of quantities
- Fluctuations in the value of labour or materials.

Construction Management

Construction management or CM is the term used in the US to describe management contracting. (See also professional construction management).

Cost Monitoring Terms

Anticipated Final Cost (AFC):

The assessment of the probable final cost of each item or cost centre in the project resulting in a total AFC for the project to be provided at regular reporting intervals during the project life.

Cost Reimbursement contract

A type of contract by which the contractor receives all his costs together with a fee. There are four common variations:
- Cost plus percentage: The contractor is paid the actual cost of the work reasonably incurred plus a fee, which is a percentage of the actual cost, to cover his overheads and profit. This form of contract is often used for maintenance work or for work where it is difficult to estimate the work to be done or for emergency work. It is possible to invite tenders on the basis of the percentage but there is no incentive for the contractor to make progress or to save money because his fee rises with the total cost of the job.

- Cost plus fixed fee: Similar to the cost plus percentage contract and used for similar situations. The important difference is that, because the fee is a fixed lump sum, the contractor has more incentive to finish quickly and maximise his profit as a percentage of turnover. It is usual for some indication of the total cost to be given to tenderers. The Joint Contracts Tribunal has produced to suitable form of contract - Fixed Fee Form of Prime Cost Contract.
- Cost plus fluctuating fee: Similar to the fixed fee contract and used for similar situations. An estimate is made of the total cost. The amount of the fee received by the contractor varies inversely to the cost actually achieved. Thus, if the costs are less than the estimated costs, the contractor receives a greater fee calculated in accordance with an agreed sliding scale and vice versa. it is to the contractor's advantage to reduce costs and finish the work quickly.
- Target Cost: Used in similar situations to the contracts previously discussed, it can also be used for a wide variety of conditions. Priced bills of quantities or a priced schedule are agreed and a target cost obtained for the project. The contractor's fee is usually quoted as a percentage of the target cost. Provision is made for the target cost to be adjusted to take account of variations and fluctuations. The contractor is paid the actual costs reasonably incurred. The total of these costs is compared with the adjusted target cost. If they show a saving, the fee is increased in accordance with a pre-agreed formula, and vice versa. The disadvantage of this type of contract lies in the complex measurements procedures involved and the difficulty in agreeing targets and percentages.

Currency Terms Funding Currency:

The currency which the funding agency will use to fund the project. (In ODA's case normally £ sterling).

Working Currency:

The currency in which payments to contractors and/or suppliers will be made. Where this is different from the funding currency it will be converted using the EXCHANGE RATE(S).

Local Currency:

The currency in normal use in the host country of the project.

Foreign Currency:
Any currency other than the local currency.

Offshore Costs:
Project costs of goods and/or services paid for in foreign currency. (This would normally be applied to all goods source from outside the host country).

Onshore Costs:
Project costs of goods and/or services paid for in local currency.

Design and Build Contract Sometimes known as a 'package deal contract'. In this type of building contract the contractor takes full responsibility for the whole design and construction process from initial briefing to completion. The JCT have produced a standard form of contract to cover this kind of work where no architect is employed by the employer (Standard Form of Building Contract With Contractor's Design, 1981 Edition). It follows JCT 80 quite closely but omits all references to 'the architect' and inserts 'the employer' instead where necessary.

It is anticipated that the employer will normally nominate an architect or clerk of works to be his agent for contract purposes.

Estimating Terms

Contingencies
Allowances included within the base estimate representing the best judgement of the estimator of the cost of undefined or uncertain items of work which the estimator considers should be provided for during the project life. Separate contingency allowances should be provided for each specific item of work which is undefined or uncertain. Contingencies should not be used to provide for a general risk allowance.

Tolerances:
The means of expressing the degree of risk in terms of a range of values above and below the estimator's best judgement within which the final cost and duration is likely to fall.

Inflation Allowance:

The allowance included in the cash estimate for fluctuations in the basic prices of labour, plant and materials during the life of the project relative to the prices applying at the PRICE BASE DATE assumed in the base estimate.

Exchange Rate(s):

The rate(s) used in the base estimate to convert the local currency or other working currencies into the funding currency.

Construction Work:

The installed value of all fixed assets that will make up the completed project including the value of all construction, erection and installation contracts, the supply and delivery to site of all plant and equipment with associated costs but excluding only the cost of non-contractor design, management, supervision and commissioning.

Engineering:

The cost of all non-contractor or non-supplier work necessary for the completion of the project. This will include fees and expenses for project management, engineering/architectural design, inspection, construction supervision, commissioning and training of operating personnel. If required the cost of financing, land acquisition and other similar costs may be included here.

Total Project Capital Cost =
Construction Work + Cost of Engineering

Completion Date:

The date on which the project is complete and ready to be handed over to the client for operation. The work done will have included the supply, delivery and installation of all fixed assets, the substantial completion of all construction (ready for operation by the client but not necessarily the completion of maintenance or defect liability periods), all design, operating instructions, all testing and commissioning necessary before operation by the client.

Excepted Risks The term used in JCT 63, clauses 20(b) and 20(c) (an now referred to in JCT 80 as 'the clause 22 perils') to describe those risks which are carried by the employer and which may affect the execution of the works although they are outside the contractor's control. The definition reflects the exceptions commonly to be found in 'All Risks' policies of insurance. In IFC 84, they are referred to as 'clause 6.3 perils'.

The definition covers fire, lightning, explosion, storm, tempest, flood, bursting or overflowing watertanks, apparatus or pipes, earthquake, aircraft and other areal devices or articles dropped from them, riot and civil commotion, but excluding any loss or damage caused by ionizing radiation or contamination by radioactivity from any nuclear fuel or from nuclear waste from the combustion of nuclear fuel, radioactive, toxic, explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof, pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds.

FIDIC There are quite a number of standards available as basis for international construction contracts. One of those is the "Conditions of Contract (International) for Work of Civil Engineering Construction" issued by the Federation Internationale Europeene de la Construction, Paris, in cooperation with four federations and associations also recognised worldwide. This standard is usually named FIDIC.

Fluctuations The cost to the contractor of labour and materials etc., used in the works will alter during the contract period. It may fall but, more usually, it will rise. In the absence of any provision in the contract, the contractor would have to take the risk. In order to cover himself, he would probably make an estimate of the likely rise in costs before inserting his prices in his tender; higher tender figures result. It is often thought to be of overall advantage to the employer, as well as giving the contractor some guarantee of recovering his costs, to insert a clause in the contract allowing the contractor to recover some or all of the increases if and when they occur; rather than price the risk. Most standard forms allow for this to be done by providing clauses which may be included or deleted as the parties agree. JCT 80, for example, has a selection of three clauses:

- 38, which allows contribution, levy and tax fluctuations - a bare minimum provision to take account of statutory adjustment to items such as national insurance contributions.

- 39, which allows labour, materials cost and tax fluctuations - the contractor can recover full fluctuations on the construction work, but not his preliminaries. This is calculated by reference to awards by the national Joint Council for the Building Industry, in the case of labour costs, and to the contractor's basic prices in respect of materials.
- 40, which allow fluctuations in accordance with price adjustment formulae rules issued by the Joint Contracts Tribunal. Details of price changes are issued monthly. There is usually provision for making part of the contract sum not subject to this formula (the non-adjustable element). With this exception, full fluctuations are recovered.

Force Majeure

A French law term, found in many standard contracts as a ground for granting extension of time. It is used 'with reference to all circumstances independent of the will of man, and which it is not in his power to control': Lebeaupin v. Crispin (1920). It is wider in its meaning than Act of God or vis major but in building contracts it generally has a limited and restricted meaning because such matters as war, strikes, fire and weather conditions are dealt with expressly.

The following events have been held to be within the definition of force majeure in varying types of contract:

- A strike.
- A breakdown of machinery.
- Supply shortages as a consequence of war.
- Refusal of an export licence.
- Fire cause by lightning.

Force majeure is referred to in JCT 80, clause 25.4.1 AND 28.1.3.1, IFC 84, clause 2.4.1, and ACA 2, clause 11.5 and 21.

Formula Price Adjustment

See: Fluctuations

General Terms

Financing Agency or Funding Agency:

The organisation which provides the finance to design, construct and commission the project: typically a bi-lateral or multi-lateral funding agency, or a commercial bank or banks.

The Client:

The eventual owners of the proposed asset: typically a government department or a parastatal body for infrastructure projects, but may be a private sector organisation, especially in the case of industrial and commercial projects.

JCT Contracts

The first form of building contract agreed between architects and builders was published in 1903. By 1931, after several editions of the form, a body known as the Joint Contracts Tribunal was set up to keep the form under constant review. Revised editions were published in 1939, 1963 and 1980. ONe of the main advantages claimed for the JCT contracts is that they are negotiated documents, agreed by representatives of all sides of the construction industry. Thus, a contract in JCT form is not an employer's 'standartd form of contract' for purposes of s.3 of the Unfair Contract Terms Act 1977 and ambiguities will not be construed *contra proferentem* by the courts. This comment is only true of the latest editon of the contracts, however, and employers who use the 1963 edition of the contracts may find themselves caught by the provisions of the Act, because the JCT has withdrawn its sanction to that edition.

The range of contracts published on behalf of the JCT is being increased constantly. At the time of writing, they are as follows:

- Local Authorities With Quantities
- Local Authorities Without Quantities
- Local Authorities With Approximate Quantities
- Private With Quantitites
- Private Without Quantities
- Private With Approximate Quantities
- Intermediate Form of Building Contract (IFC 84)
- Agreement for Minor Building Works
- Fixed Fee form of Prime Cost contract
- Agreement for Renovation Grant Works (where an architect is employed)
- Agreement for Renovation Grant Works (where no architect is employed)
- Standard Form With Contractor's Design.

A large number of tender documents, agreements, supplements and sub-contracts have been produced for use with the main forms of contract as follows:

- Fluctuations Supplement for Local Authority editions
- Fluctuations Supplement for Private editions
- Standard Form of Building Contract 1980 Formula Rules
- Sectional Completion Supplement 1980
- Minor Works Supplement 1980
- Standard Form With Contractor's Design Formula Rules
- Contractor's Designed Portion Supplement
- NSC/1 Nominated Sub-Contract Tender and Agreement
- NSC/2 and NSC/2a Employer/Nominated Sub-Contractor Agreement
- NSC/3 Standard Form for Nomination of a Sub-Contractor
- NSC/4 and NSC/4a Sub-Contract
- FS NSC 80 Fluctuations Supplement (for both sub-contracts)
- Standard Form of Sub-Contract 1980 Formula Rules
- TNS/1 JCT Tender for Nominated Suppliers 1980
- TNS/2 JCT Warranty for Nominated Suppliers 1980
- Fluctuations Clauses and Formula Rules (Supp/IFC 84)
- Tender and Agreement for Named Sub-Contractors under IFC 84 (NAM/T)
- Sub-Contract Conditions for Named Sub-Contractors under IFC 84 (NAM/SC)
- Sub-Contract Formula Rules for Named Sub-Contractors under IFC 84 (NAM/SC/FR)

A comprehensive set of practice notes is available and is updated on a regular basis. Standard Contract administration forms are also available. All JCT contract and supporting documents are published by RIBA Publications Ltd, Finsbury Mission, Moreland Street, London EC1V 8VB.

In Scotland, special supplements are published by the Scottish Building Contracts Committee.

A comparison of the principal features of common forms of contract is given in Table 25.

Liquidated Damages

A sum of money stated in a contract as the damages payable in the event of a specified breach. The sum must be a genuine pre-estimate of the loss likely to be caused by the breach or a lesser sum. There is no need to prove actual damage after the event and it does not matter that the actual loss is greater or less than the stated sum.

All the common forms of building contract include a liquidated damages clause to calculate the amount payable if the contractor fails to complete by the completion date or any extended date. A sum is included to represent the damages on a weekly or daily basis as appropriate. If no figure were stated, the employer would need to prove his actual loss and recover it by way of 'unliquidated damages' through court action.

Lump Sum Contract

When one party carries out work for a stated and fixed amount of money payable by the other. All the main forms of building contract are considered to be lump sum contracts even though they contain provisions for adjustment of the contract sum for such things as fluctuations and variations. The important point is that the original contract sum is stated for a given amount of work. Some contracts are expressly not lump sum contracts, e.g., JCT 80 Private edition, With Approximate Quantities. If the contract expressly provides for remeasurement, it is not a lump sum contract.

Management Contracting

With management contracting the contractor works alongside the design and cost consultants, providing a construction management service on a number of professional bases. The management contractor does not undertake either design or direct construction work. The design requirements are met by letting each element of the construction to specialist sub-contractors.

Measure and Value Contract

A general name given to any contract where there is no fixed contract sum (lump sum contract) but where the work is measured and valued by the quantity surveyor as it proceeds in order to arrive at the price to be paid to the contractor.

Measurement Contract

Normally used where the precise quantity (and sometimes type) of work cannot be accurately determined at the time of tender. A basis is provided for tendering purposes and the completed work is measured and payment made in accordance with the tender rates. Two main types of measurement contract are:
- Where approximate quantities are used. This type is suitable where the type of work is known but the quantity is unknown.
- Where a schedule of prices is used. This type is suitable where even the type of work is not known for certain.

Negotiated Contract

A contract which is not put out to tender, but where the price is agreed by negotiation between the parties.

(ICE) New Engineering Contract

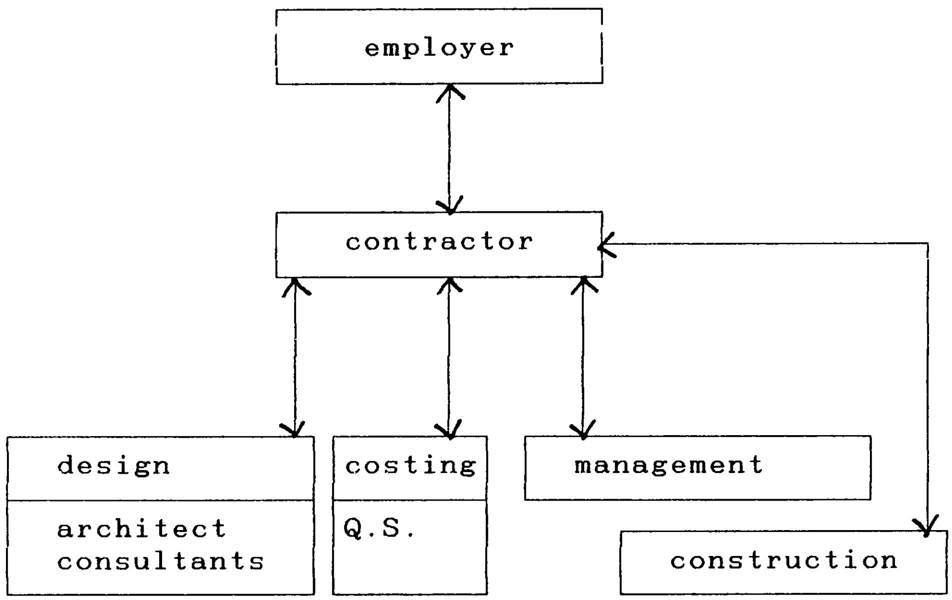
The Institution of Civil Engineers recently published both a sixth edition of the familiar ICE Conditions of Contract and a draft consultation document called the New Engineering Contract (NEC). The two should not be confused because while the first is the latest development of a traditional form of contract, the latter is the result of a completely fresh approach.

Package Deal Contract

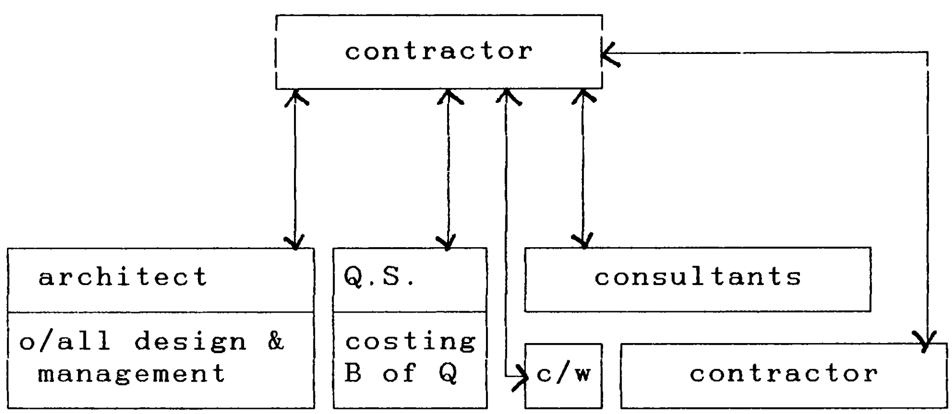
Sometimes known as 'design and build contracts' because they incorporate both elements in one package (hence 'package deal'). Figure 23 compares this type of contract with the traditional form. The main benefit, from the employer's point of view, is that the package deal places all the responsibility for the work, from taking the initial brief to completion of the work, in one place - with the contractor. If something goes wrong or there are defects, the employer is not faced with the usual problem of sorting out design from constructional responsibilities. On the other hand, the employer has no independent advice on which to call if he is in doubt since the contractor, however kindly motivated, will have his own financial interests at heart. An unscrupulous contractor could take advantage of the employer's lack of expertise. It is up to the employer to weigh the pros and cons before deciding which system to adopt or else appoint a professional to supervise the work in his behalf.

Figure g.1

Package Deal Contract



Traditional Contract



<——————> lines of contractual relationship

Performance Specification An alternative to the specification as traditionally understood. Instead of describing precisely all the work and all materials required in a building, the performance specification sets out criteria which must be met by the contractor. The idea is to give the contractor maximum scope for initiative and price competition. For example, a traditional specification might describe an external wall in terms of type of brick, number of courses to a given height, thickness of wall, size of cavity, material for the internal leaf, insulation type and thickness, wall ties, DPC, etc. A performance specification would require that the wall would last a given number of years, be waterproof, have a given U-value, have a certain colour range, have certain maintenance characteristics, etc. The criteria may be very precise or very broad and commonly contain the overall requirement of compliance with building regulations and British Standards.

The writing of a performance specification is a skilled task and may take longer than a traditional specification. It is a mistake, therefore, to use a performance specification to attempt to overcome pressing deadlines. It is important to make a clear distinction, in the specification, between those criteria which are mandatory and those which are at the contractor's discretion. Outline dimensions drawings are usually provided with the specification and form part of the contract. The other essential part of the contract documentation is the contractor's proposals. JCT Design and Build Contract provides a list of the contract documents in clause 2.1. Very often, the architect will prepare a performance specification for work for which he intends to invite tenders with a view of nomination. A lift installation is a good example of work which requires a performance specification in order that a proper comparison of prices can be made.

Procurement Procurement is the amalgam of activities undertaken by the client to obtain a building.

Professional Construction Management PCM is a term used in the US to describe an arrangement whereby the tasks of planning, design and construction are integrated by a project team comprising the owner, construction manager and the design organisation.

Project Management A very loose term for referring to the management of a building project.

A project manager may be appointed by the employer to co-ordinate the entire job from its inception to its completion. His relationship with the other professionals must be clearly set out and respective powers and responsibilities established. Since practice varies from contract to contract, it is impossible to define his role precisely. He could be appointed to take over the whole of the architect's traditional management and co-ordinating functions together with those of the main contractor. The concept is still in the process of evolution.

The supporters of project management suggest that it provides an efficient and cost effective method of producing a building. Opponents believe that it fragments existing responsibilities and fails to achieve any improvement in timing and cost.

Project managers can be architects, engineers, quantity surveyors, surveyors or managers specializing in the building field. Diagrams showing the relationships of project managers to other members of the building team are at Figures g.2 and g.3.

Figure g.2
Project Management 1

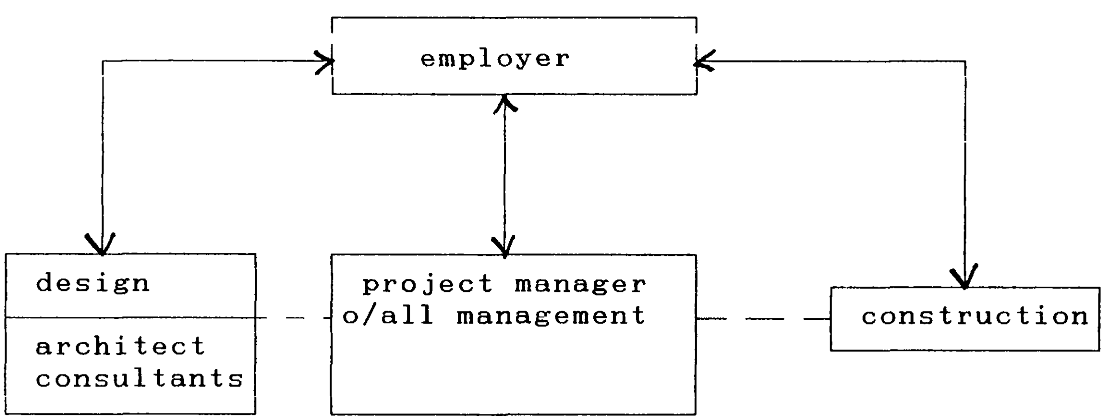
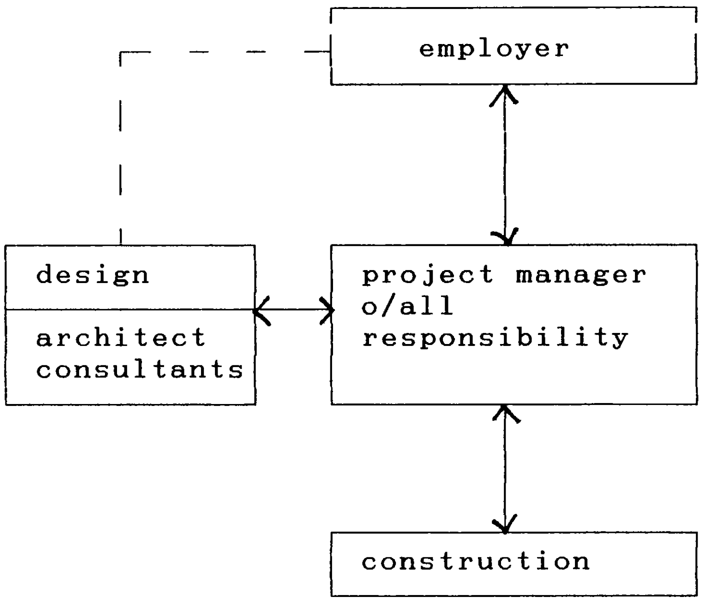


Figure g.3
Project Management 2



lines of contractual relationship
lines of functional relationship

RIBA Contracts An incorrect and outdated method of referring to the standard forms of contract published by the Joint Contracts Tribunal. The title was correct until 1977, when the Royal Institute of British Architects withdrew its name from the documents, which are now correctly referred to as the JCT forms. Despite the fact that these contracts are prepared and issued by the Joint Contracts Tribunal, the copyright is said to be vested in RIBA Publications Ltd. By item B 586 of Court Business (5 August 1977) the judiciary and legal profession were instructed to refer to what is now JCT 80 as 'the JCT Contract' or 'the Standard Form of Building Contract' but this direction is widely ignored in practice. The current (1980) JCT Contract derives from a form agreed as long ago as 1893 and agreed by various representative national bodies in 1909. Further editions were issued in 1931, 1939 and 1963, all of which were known as 'the RIBA Contract' and are so referred to in the law reports and textbooks, largely because they were published by the RIBA.

Risk Most experts define risk in terms of its parent - uncertainty. Uncertainty is simply the set of all potential outcomes, both favourable (if any) and unfavourable (if any). Those outcomes which are favourable represent risk, whereas those which are favourable represent opportunity. Thus, uncertainty can give birth to either, or both, risk and opportunity.

Risk is also defined as the probability that an unfavourable outcome will occur. Similarly, opportunity is defined as the probability that a favourable outcome will occur.

A popular way to catalogue uncertainties (and thus risks and opportunities) is in terms of known, unknown and unknown unknown situations or conditions. Using examples in our personal lives, an individual playing the stock market (which has both risk and opportunity) or operating a power saw (which has only risk) is aware of a range of potential for occurrence is not immediate nor would one normally expect it in the course of the activity. A disease such as cancer is an example - you know it exists in our society and could strike you, but you do not see a direct threat to your life until it is diagnosed. You see the potential for loss of your job, a serious auto accident or a lawsuit by someone injured on your property as other known unknowns. The unknown unknowns are the situations we have not even heard about or can not imagine; yet, we realise that some unforeseen risk can materialise to threaten us. AIDS was an unknown unknown risk until recently.

Serial Contract

If it is desired to carry out a number of contracts in succession this type of contract may be employed. On the basis of the successful tender for the first contract, further contracts are negotiated. To operate properly, all the projects must be similar in construction and type so that negotiation for future contracts on the basis of the original contract is feasible. It is usual for the employer to make some sort of limited commitment to the successful tenderer for the whole series. However, it is not something which can be legally enforced since it is always subject to the successful outcome of negotiations. The advantage is that one set of tendering takes place and the contractor can use the experience gained on the first contract to improve efficiency thereafter. For maximum benefit for the employer, the basic terms for succeeding contracts in the series should be established when calling for the initial tender. An intended programme for all contracts in the series should be set down at the outset if the contractor is to be able to calculate the potential benefits to the full. The system should produce savings for both parties but it is often difficult to operate in practice.

Standard form of contract A printed form of contract containing standard conditions which are applicable (or can be made applicable by the use of alternatives) to a wide range of building projects. They are generally preferable to specially drafted contracts because they are intended to be comprehensive and avoid most of the pitfalls which surround contractual relations in the building industry. Examples of standard forms are:

- The JCT series of contracts.
- The ACA contract.
- GC/Works/1 and 2.

A comparison of some standard forms is shown in Table .

Target Cost This term is used to describe the amount which the client expects to pay for the design and construction of the completed building and the forecast tender price.

It is not a term of art nor does it appear in the BPF edition of the ACA Form of Building Agreement. Target cost is also a term used to describe a contract in which the contractor is paid his prime cost, but if this exceed or falls short of an agreed target the difference is shared between the contractor and the employer in pre-agreed proportions.

Traditional Contracting The traditional form of contracting is where the client appoints an architect or other professional to produce the design, select the contractor and to supervise the work through to completion. The contractor is selected on some basis of competition.

Turnkey Contract The term sometimes used to describe a contract where the contractor is responsible for both design and construction. Alternatively such contracts are called 'Package deal' contracts. They are sometimes encountered in the industrial field.

The term has no precise legal meaning (Cable (1956) Ltd v. Hutcherson Brothers Pty. Ltd (1969)) and its use is best avoided. The alleged advantages of such contracts are project cost, co-ordination and speed. Against this must be set the substantial disadvantage that the client is sometimes deprived of an impartial third-party check. 'Package deal' contracts are most suitable for specialist engineering fields where companies possessing highly developed expertise may offer such proposals as the only access to that expertise.

Value Cost Contract

In this type of contract, the contractor is paid only a fee which fluctuates depending upon the actual cost of work compared with a valuation made on the basis of an agreed schedule of prices. The fee is increased or reduced depending upon the contractor's success or failure in meeting the agreed valuation. The cost of the work is paid directly by the employer. A disadvantage is the complex accounting and measurement procedures required. The value cost contract is useful where a continuous programme of work is involved and time is at a premium.

Cause	JCT	IFC	MW	ACA	GC/Works/1
By Employer					
Contractor wholly suspends the work	/	/	/*	/	
Contractor fails to proceed regularly and diligently	/	/	/*	/	
Contractor does not comply with instructions re defective work, etc	/	/		/	/
Contractor assigns without consent	/	/		/	
Contractor fails to operate fair wages clause	/[2]	/			
Contractor bankruptcy or liquidation, etc	/.	/.	/*		/*
Contractor corrupt	/[2]*	/[2]*			/*
Contractor otherwise in breach				/	
At the employer's discretion					/*
By Contractor					
Non-payment	/	/	/	/	
Obstruction by employer	/*	/	/	/	
Delay in works for specified period due to: *Force Majeure*	/*				
Damage by insurance contingencies	/*				
Civil commotion	/*				
Certain A.I.s	/*	/			
Late instructions	/*	/			
Delay by employer's men	/*	/			
Opening up and testing	/*				
Failure to give access		/			
Employer's breach			/	/	
Employer bankruptcy or liquidation, etc,	/[1]	/*	/*		
By Either Party					
Damage to existing works due to insurance contingencies	/*				
Outbreak of hostilities	/*				
Suspension of work for specified period due to: *Force Majeure*		/*		/*	
Damage by insurance contingencies		/*		/*	
Civil Commotion		/*			
War, etc				/*	

1 Not applicable to local authorities
2 Only applicable to local authorities

* Notice not required before determination
. Automatic determination

Source: Building Contracts Dictionary

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