THE PROCUREMENT & COST MANAGEMENT OF A HIGH RISE BUILDING IN COLOMBO SRI-LANKA — A CASE STUDY

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ABSTRACT

The Sri-Lanka construction industry has undergone significant changes in the past three decades due to the revision of previous economic policies and accepting the World Bank and IMF support for structural adjustments to the economy with a view to creating a capital base in the country. These changes involved large engineering and building works, which provided numerous opportunities for capital investment. The country also pursued a policy of incentives and infrastructure support to private sector businesses and investment. This encouraging economic environment attracted many foreign investors to invest in Sri-Lanka both in infrastructure and property developments. (Board of Investment of Sri-Lanka 1994). The following project is the second high rise multi-use residential cum office complex to be executed in the city centre of Colombo Sri-Lanka on a foreign and local joint venture partnership. In recognition of this impact, this paper attempts to critically appraise the implementation of such a project in Sri-Lanka and sets out to comment on the differences found between the traditional process and the actualities in respect to the selection of the project organization, the roles and responsibilities of the actors and the project cost management. Further it focuses on the weaknesses found in the administration of the construction process commencing from inception to completion in fulfilling the project goals and describes the experiences gained and the lessons to be learnt in the implementation of similar projects.

Key words: Construction industry, Construction process, Cost Management, Joint venture, Project goals

INTRODUCTION

The construction industry is the sector of the economy, which transforms various resources into economic, social, infrastructure and facilities. The Sri-Lankan construction industry underwent significant changes from the latter part of 1970s due to the introduction of free market economic policies by the government. The authorities pursued a policy of incentives and infrastructure support to the private sector businesses and investments that were for both local as well as foreign. Low wages, abundant labour and an educated labour force with literacy rate of nearly 90% also supported this. Sri-Lanka had an attractive investment structure for a wide range of industries. The attractive packages of investment incentives included tax free holidays, free transfer of shares, double taxation agreements with almost 30 countries, the right of 100% foreign ownership in almost every industrial sector, duty-free imports of plant, machinery, raw materials and other project-related goods, duty-free exports, free repatriation of profits. All investments were guaranteed by the island's constitution and international agreements. (Board of investment of Sri-Lanka, 1994) This led to a construction boom both in the infrastructure and the housing

sectors. This investor friendly environment led to the creation of number of joint ventures between foreign and local developers to invest in infrastructure as well as in building projects. These consisted of housing projects both medium and high-rise and warehousing projects for the manufacturing sector to maximise the benefits offered by the Sri-Lanka government. This project is one such high-rise housing project constructed in the major city centre of Sri-Lanka.

THE AIM

This paper sets out to discuss the above project constructed in the city centre of Sri-Lanka and attempts to analyse the organization of the construction process of this project from inception to completion with respect to the traditional practices found in Sri-Lanka. It also attempts to comment on the essential differences between the traditional model and the actual in respect of the roles and responsibilities of the parties that contributed in the implementation of the project to achieve the client's goals. The reasons for the divergences are then analysed to see whether these deviations were caused due to the break down of rules and roles laid out in traditional models when applied into real life situations. It further describes the experiences gained and lessons to be learnt to improve the process.

GEOGRAPHICAL, NATIONAL, ECONOMIC, CULTURAL AND POLITICAL CONDITIONS IN SRI-LANKA

The country's background is given briefly in terms of its geographical, national, economic, cultural and political conditions so as to give the climate in which this project was implemented. (Annual Report of Central Bank of Sri-Lanka, 1991)

Location and Size

Democratic Socialist Republic of Sri-Lanka is an island of approximately 65,000-sq. km. in area with 950-sq.km of inland water. The island is located at the tip of the Indian subcontinent surrounded by the Indian Ocean. The recorded history of Sri-Lanka goes back to more than 2500 years. Sri-Lanka received independence from British Colonial rule in 1948. It is now following a parliamentary system with an executive president.

Topography and Climate

The landscape features of the island can be described as having central mountains and low-level plateau at sea level. One fifth of the land area is in forest. The mean temperature ranges from 25C to 29C. The central hill country has a cooler climate while the climate is hot and humid in the coastal areas. It has two seasons, the rainy season and the dry season with two monsoon seasons.

Population

The population is about 18.3 million and the growth rate is about 1.35%. The country's population is considered as multiethnic and multicultural. The population is predominantly Singhalese Buddhist with minority populations of Tamils, Muslims, Malays and Burgers or Eurasians. The various religions existing are Buddhism, Christianity, Muslim and Hinduism.

The Economy

The economy is still predominantly agriculture based but in recent years due to the new economic policies there has been an increased volume of investments in industries in garment factories boosting

manufactured exports. The other exports have been Tea and Rubber. (Annual Report of Central Bank of Sri-Lanka, 1991).

The Construction Industry

The construction industry in Sri-Lanka has a very long history to the extent that construction of irrigation tanks and other structures in Sri-Lanka during the 5th and 6th centuries is documented. During the period of the 80's the construction industry grew by 60% in real terms, its share in the gross domestic product (GDP) rose to 8.9% and its contribution to the gross national product (GNP) 15%. However, at present, its contribution is 3.4% of the gross domestic product (GDP). The construction industry consists of formal sector and an informal sector. The informal sector is characterised as a self-build sector not licensed or registered. The formal sector consists of different types and sizes of firms. The construction firms have to be registered with the government authority to execute government projects while it is not essential for the execution of the private projects. The professional service sector consists of architects, engineers civil and structural, electrical and mechanical engineers, quantity surveyors, and other consultants such as geo-technical and land surveyors. The services of these consultants are utilised in the design and construction process. The contractors even though are part of the building team, their expertise is not utilised in the design process but only for the procurement or the construction process. Therefore, there exists a major division between the design consultants and the contractors resulting in project delays, delayed payments and cost over-runs. Dispute resolution is by arbitration and litigation. The free market economic system implemented by the government of Sri-Lanka brought with it, economic strategies for development of the construction industry. (De Zylva et al, 1990) The new investment policies tended to regard the construction sector and housing in particular as a resource generating activity. New initiatives were launched in construction, which stimulated the production of building materials, increased employment opportunities and soon made the construction industry a lead sector of the development. The incentives were given by the government for development of large-scale infrastructure projects with minimum investment of US$ 25 million. The infrastructure projects included hospitals with minimum capacity of 100 beds, housing over 200 units and warehousing complexes. Due to these initiatives by the government, a boom characterised the construction industry. This resulted in many foreign investors joining up with local business and development clients to form joint ventures to invest both in the infrastructure and housing developments to make use of the investment incentives. (Annual Report of Central Bank of Sri-Lanka, 1991).

FACTS - ACTORS AND THE PROJECT

Owners and the Project Goals

The owner was a joint venture between public/private sector client from Sri-Lanka, an fund manager from Hong Kong and an investor from Malaysia. The intention of the owner was to construct a high-rise multi-use residential cum commercial complex with parking to maximise the benefits given by the government of Sri-Lanka for foreign investors. Further the owner intended to make the residential part of the complex to be both a service apartment to a five star hotel in Colombo and sell part of the apartments on condominium titles. The prospects of the company was that it had conducted a market survey to determine the supply and demand of property and had formulated careful projections in the areas of the facilities, on the product mix and efficiency ratio of 85% in order to maximise rental income. Due to the duty free benefits for import of material and equipment the total project cost was discounted by approximately 30%. The marketing consultants expressed confidence in marketing the project and maintaining high occupancy levels with the expectation of early generation of tax-free profits in the first year of commercial operations. ((Personal communication, 1998)

Location

The site was located on an 11.5-acre site accessible from two major highways in Colombo. It was within the premises of a 5 Star hotel in the central business and residential district of Colombo.

Scope

The scope of the project consisted of the following three phases:

Phase One: A new lobby and a porte-cochere to join the existing hotel with the new development. Phase Two was a 23-storey residential apartment block consisting of 149 units with a gross floor area of 24 576 sq .m, 23-storey office block with a gross floor area of 29 960 sq. m, retail area of 7200 sq. m consisting of two levels of shops and recreational facilities and parking area of 26 824 sq.m to park 488 cars. Phase Three was similar to that of second phase.

The Actors

In Sri-Lanka, the traditional practice used for procurement of buildings in the formal sector is very similar to the standard approach used for procurement of buildings in many developed countries. The approach is a co-operative effort between the client and various consultants. The client provides a set of requirements and constraints that the consultants attempt to satisfy during the design process. To satisfy the clients brief, a design team is appointed consisting of all the consultants. The architect heads the team in most cases. However, in recent times. a project manager who takes care of the client's interests also heads the team. (Karunaratna, 1989). In this project. the actors ranged from international to local due to the major portion of the funds for the project being from the foreign counterparts. The other reason was that there was not in existence in Sri-Lanka a similar building of the magnitude described above and the owners felt that foreign expertise was necessary in the design and construction of such a project. However, it was also decided that local experience was necessary to implement the project in Sri-Lanka. Therefore, the following parties were commissioned initially for the project. (Personal communication, 1998)

Role of Consultants

The Architects for the project was selected initially. However, there was a deviation from the normal practise of commissioning one architectural firm for the project. There were two architectural firms selected for the project. The design or conceptual architects were chosen from the international arena. This was a firm of American architects that had an international reputation for designing apartment complexes around the world. The other firm was one of the large local architectural companies. They were chosen and commissioned as the "architect on record" to do the detail designs and to attend to all the local statutory requirements. The structural engineers for the project were once again an international firm of structural engineers from USA. This was due to the local structural engineers not having similar experience in the design of high-rise buildings of this magnitude. The quantity surveyors for the project were chosen within Sri-Lanka, a subsidiary of the local architectural firm. Similarly, the mechanical and electrical engineers were from the same local architectural firm since in Sri-Lanka consortium practices were in existence. (Personal Communication 1998)

Role of the Contractor

The contractors were pre-qualified from a newspaper advertisement that appeared in selected international and local papers. The contractors were chosen after evaluation of a pre-qualification document submitted by the prospective tenderers. The contractor was responsible for construction of the project according to the standards specified by the consultants, co-ordinate all the subcontractors and the nominated subcontractors to be with in the overall construction programme. Responsible for

procurement of all plant equipment and material, maintain site safety and site security, update the construction programme as and when required, maintain adequate resources on site, submission of guaranties, warranties and as built drawings, submission of monthly bills for payment and responsible for due completion of the project according to the construction drawings, maintaining the quality levels desired.

The Role of Accountants and Auditors

The Role of the Accountants and Auditors for the project was to obtain tax advice and to determine how to maximise the benefits from tax, obtain concessions and the incentives given by the government and to obtain and organise finances for the project. Further the client had its own accounting department to monitor the project funds, monitor the cash flow and for the disbursement of payments to the consultant and the contractors according to the payment schedules agreed.

PROJECT ORGANISATION AND CONTROL

The design process and the construction process are an integral part of the building process. However, in many parts of the world, this total process is defined either as a building process or as the construction process. Despite the phraseology used the construction process is a very complicated with many different participants influencing the result. It is therefore important that the owner identifies the project goals and the project organization structure with established lines of communication to achieve the project goals. (Soderberg, 1998).

The organization structure of the project was very similar to that of the standard approach used. However, differences existed between the traditional model and the actual due to the nature of the project. The client first appointed the consultants for which there were separate client-consultant agreements. In this instance the co-ordinating role was entrusted to the architects who became the lead consultants in the design process. There were two organisational structures, one for the design process and one for the construction process. In the construction process the project manager became the leader but, in the administration of this process, there was duplication of the roles between the project manager and the architect. In the design process, the role and the responsibilities of the designers were twofold. The responsibility of the conceptual designs was by the foreign firm of architects while design development was by the local architectural firm. The client had a separate contract agreements with conceptual architects and another one later with the local architects. The client consultant agreements were based on the standard type of contract issued by the Royal Institute of British Architects. The client did the project briefing to the conceptual architects and the conceptual designs were completed in USA. The completed conceptual designs were then handed over to the design architects, the local firm of architects for the balance activities. This included all the remaining activities of the design stage and production stage such as design details, production drawings, specifications and the co-ordination of the structural, mechanical, electrical and quantity surveying work. In other words the design architects were responsible for the co-ordination of all balance activities with other consultants.

Up to this stage there was no project manger appointed. Due to the absence of the client's representative (even though the design architects had taken this role) there were difficulties in the co-ordination of the project. The reason was the inadequate experience of the local designers to co-ordinate a project of this magnitude. The result was the delay in the design process. Due to this reason a project manager was appointed at this stage. In the implementation of the construction works, the building works was divided into two packages, the substructure package and the superstructure package. There was one contractor for the sub structure package and one main contractor for the superstructure package, which included the work of the nominated subcontractors for the specialised works. However, the responsibility of the substructure contractor was maintained until the end of the defect liability of

the superstructure contractor by retaining the performance bond and the retention fund till end of the total project. The reason was that the client needed a guaranty on the work of the substructure contractor till such time the superstructure load was loaded on to the foundations.

The project manager appointed was responsible for the performance of the project with in the budget. However, his role and responsibility commenced only from the evaluation of tender to award and completion of the project. This created difficulties in the implementation of the project goals. The organization structure depicted a line staff organization. However, the lines of communication, the roles and responsibilities between the main actors such as the project manager and the design architects were not clearly established. This led to misunderstandings on the project specifications, thus leading to design changes and time delays. The appointment of the project manager was rather late in the project. The project manager was appointed only at the tender stage thus deviating from the traditional practise of appointing the project manager at the inception of the project.

Both the conceptual designers and the detail designers played the lead role till the tender stage. Due to the magnitude of the project and the designers being at two different locations, the lines of communication were not smooth between the parties. The design process suffered due to these reasons. A number of discrepancies and inconsistencies, that existed in the documentation had to be dealt at the construction stage leading to number of cost overruns and time over-runs. There was no cost limits set by the client other than overall budget and opportunity for cost checking availed only at the later stages. (Personal Communications, 1998)

PURCHASING-PROCUREMENT-CONTRACTING FORMS

Procurement

The purchasing and procurement of the project was divided into two phases, the pre-contract and post-contract. The pre-contract phase included the stages of conceptual design, detail design and up to award of tender. During the early pre-contract phase there was a necessity to call for procurement of two tender packages. Namely the

- Soil investigation tender package
- Land surveying tender package.

Both the packages were prepared on the lump sum payment form based on the requirements of the structural engineer, who stipulated the scope of work and the time period. The contract form used was the (UK's) JCT 80 modified to suit the Sri-Lankan Conditions. The tenders were called, evaluated and awarded to the lowest tenderer who conformed to the consultant's specifications and conditions. A letter of intent was issued to the selected contractor for commencement of work. Signing of the contract with the client followed once the consultants prepared contract documents for signature. The payments to the contractor were made according to the agreed payment schedule after the recommendation by the consultant for the actual work done at the site. In Sri-Lanka, the procurement methods used can be identified a as standard or traditional approach, the design and construct approach, the divided contract approach or management contracting, the early selection approach, the direct labour approach and many combinations of these approaches. In this project, for the purpose of procurement of the consultants, the standard approach was used. However for the procurement of the building proper a combination of the standard and the divided contract approach was used, where the tender was divided into number of packages. Packaging was done to give the designers adequate time to design so as not to delay the project and to Fast track so as to obtain maximum design time as well to commence work early on site. The packages prepared for purchasing and procurement were as follows:

- The Substructure Packages which consisted of piling, pile caps, diaphragm wall, ground beams
- The Superstructure Package, which consisted of the ground slabs and the structural frame including upper floor slabs and beams.

- Architectural Package consisted of internal and external walls, all the external and internal finishes but excluding the fit-out
- The Services Package which consisted of mechanical, electrical, air-conditioning, fire, close circuit television and all other services
- The External works and Landscaping Package.
- The interior fit-out package

The first package to be awarded was the substructure package and this was awarded as a separate package. This was completed before the superstructure package was awarded. The nominated packages of various services followed this depending on the programme. The superstructure contractor was made the main contractor and was also responsible for the co-ordination and the performance of the nominated subcontract works in the site. The main contractor was paid an attendance fee (a percentage fee on the cost of nominated subcontract work by prior agreement with the client/project manager) for his role and responsibility of this works. The responsibility of substructure contractor was maintained until the end of the defects liability period of the main contractor, which was till the end of the total project. (Personal Communications, 1998)

Contract Form

In Sri-Lanka, various approaches of procurement mentioned above are combined with various payment forms to fulfil the demands of the client. The payment forms used are fixed price contract with lump sum, schedule of prices or measure and value and cost reimbursement contracts with fixed fee, percentage fee, value-cost or target costs. In this project the payment form used was the fixed price contract with lump sum. However, there was a deviation from the standard form of lump sum. Instead of giving the tenderer only the drawings and specifications, the tender documents included a bill of quantities. This was given as a guideline. The purpose of the bill of quantity was so that the tender stage could be shortened, for easy evaluation of the tenders and to use it as a schedule of unit prices in the event of variations and changes. This way it was both beneficial to the contractor as well as to the consultant and the project manager in the implementation of the contract. It further helped in the monthly bill certification, evaluation of variations and in the cost control of the project. The administrative conditions used in Sri-Lanka for government contracts are a modified version of FIDIC for civil engineering contract. The 'FIDIC version' has been changed to suit the construction conditions in Sri-Lanka. It has general conditions as part one and parts two as particular applications. The payment form defined in the conditions use monthly indices for payment of fluctuations in prices if building materials, labour and fuel. A bill of quantity forms part of the contract and the works are re-measured. The disadvantage of this form of contract was that the client was unable to arrive at the final costs of the project. (ICTAD, 1992). Therefore, for this project, the client did not use this form of administrative conditions but used a standard form of administrative conditions used in the UK. The JCT 80 was used, as it was familiar to all parties. However, these conditions were suitably changed by the special conditions so that it could be implemented in a Sri-Lanka construction environment.

PROJECT PLANNING

Project planning is the key to success of any construction project. In this project, the bar chart principle was used for the design process. It was done in two phases. The architect on record or the detail designers prepared the programme in the form of bar chart identifying the activities and the time frames for various consultants as per the original schedule agreed with the client. Each individual consultant was paid according to the work done, which related to a disbursement schedule that was agreed with the client. The payment of fees and the work phases agreed with the client was according to the Plan of work prepared by the Royal Institute of British Architects for building works.

The stages identified in this work plan was, the briefing stage, the sketch design stage, scheme design stage, the detail design stage, the working drawings and specifications, the bill of quantities, the tender stage and the construction stage. The tender stage included pre-qualification of tenders, tender evaluation and award of tender. The construction stage included periodic supervision by the various consultants. All parties of the design team agreed to these work stages. The disbursement of fee at various stages was done by the clients financial department as a when the work was completed by the consultants according to the work programme. Once the production drawings the specifications and the bills of quantities were prepared the tender documents were formulated for calling of tenders. On the return of the bids the tenders were evaluated, short-listed, negotiated and awarded to the lowest bidder. The award of tenders was done according to the master programme prepared by the project manager who was appointed at this stage. This was the basic project planning that was expected from the lead consultants who co-ordinated the project. However, in the real implementation of the project, many problems were encountered due to lack of detailed planning, The divided responsibilities of the designer's role led to the detail designers not having much communication with the conceptual designers who completed their designs in the United States. Even though the local consultants sent an architect to USA, the time period was inadequate to understand and absorb the total requirements of the design concept, the materials and the design detailing that was required for a project of this nature. This delayed the design detailing process, which in turn delayed the project programme. This, in turn, gave rise to a chain reaction of delays on the part of all the consultants. There was no adequate time to do either analysis or alternative design proposals to influence the final quality or economy of the project. During the construction process the project manager depended on the critical path method for project planning. The contractor was requested to submit the network analysis, which was updated from time to time. (Personal communications, 1998)

PROJECT FINANCING

The estimated cost of the project for the phase one and two, as described above, including land development cost, pre-opening expenses, working capital and contingencies were US 50 million dollars. The contingencies included construction contingencies, cost escalation due to inflation and currency devaluation. In order to qualify for the incentives and tax benefits given by the government of Sri-Lanka, it was necessary for the foreign party to invest in dollars. The agreement by the joint venture for financing of the project was such that the local parties' equity was the land, which was part freehold and part leasehold. The apartment complex was built on free hold so that it could be easily disposed of on condominium titles. Since the initial revenue was to be from the pre-selling of the apartments, the bridging finance to commence the first phase was given by the foreign investors. The balance for the completion of the project was based on a marketing plan of the apartment with payment terms defined for the buyer. The payment terms defined a down payment for the apartment, which confirmed to the seller the confirmation of the buyer as well as the revenue to carry out the balance of construction work. This marketing plan was connected to the cash flow of the project. This gave undue pressure on the marketing consultants to pre-sell the apartments. The marketing strategy was based on the feasibility prepared to establish the selling price of the apartments. Financing of the project was in two stages. The foreign counterparts agreed to finance the initial construction cost of the project according to the government regulations in order to gain the incentives given by the government for this kind of project. The local party had part of the land as free hold and part of the land on leasehold as equity on the project. The financing strategy was to commence construction with the bridging finance provided by the foreign investor and at the same time commence pre selling of the apartments. The advance payments given by the prospective buyers would finance the project. In reality this strategy could not be adopted totally since the project was delayed. With the delay, the country's economic environment changed and part of the scope had to be deleted due to many reasons such as change in the economic climate, lack of funds and so on. (Personal Communication, 1998)

BUDGET AND BUDGET CONTROL

The consulting quantity surveyors prepared a preliminary cost estimate for the development. The initial cost estimate was prepared on the basis of prevailing construction costs in Sri-Lanka and in the region, on the available historical costs of similar projects and on the conceptual designs prepared by the conceptual architects. The cost estimate/cost plan was structured on an elemental basis with only the main elements such as preliminaries, substructure, superstructure, services external works, landscaping including design risk, and construction contingencies. The fit out was a separate budget. The main elements such as the superstructure were further divided into structure/core, external cladding, internal cladding and the floor wall and ceiling finishes. The service was divided into air-conditioning, hydraulic, fire, electrical, sewerage and other services. After the preparation of initial cost plan it was revised three times at various intervals. However due to inadequate briefing at the initial stage to arrive at cost limits related to the quality levels, divided responsibilities of the designers, the project lacking co-ordination to implement structured continuous economic control there was a cost overrun at the tender stage. This necessitated striping of the design to maintain required budgetary levels. (Personal communications, 1998)

TENDER AND AWARD

The initial interest for submission of bids was by a newspaper advertisement that appeared both in the local and selected international papers. Of the thirteen interested bidders, five were short listed on submission of pre-qualification document, which identified their financial, and technical capabilities, the previous experience on similar projects and the resources of each of the bidders. The tender documents prepared by the consulting quantity surveyors consisted of Invitation to tender, Form of tender, Conditions of tender, Articles of agreement, General conditions of contract (a modified version of JCT 80) Payment form lump sum, Appendix to the general conditions of contract, Special conditions of contract, General specifications (Standard document prepared by construction authority), Special specifications (provided by Architects) Bill of quantity (Only as a guideline to the contractor for pricing the tender). The checking to reflect whether the total scope was included in the drawings and Bill of quantities was the responsibility of the tenderers. (Personal Communication, 1998)

Competitive tendering was used. The pre-qualified bidders were invited to submit their tenders at predetermined time and place. Unlike the general practise of Open tender this was a close tender and the bid was not opened in the presence of bidders. The purpose was for negotiations. The quantity surveyors evaluated the bids. The evaluation was based on the lowest price, reasonable conformity to specification, the short construction period given and payment terms requested. The tender evaluation report was submitted to the client. On approval by the client, negotiations were held with the three short-listed bidders. The lowest bidder from the negotiations was recommended to the client.

On acceptance by the client, a formal letter of award was prepared by the consulting quantity surveyors identifying the final amount, the date of commencement and completion, the type of bonds and guarantees to be submitted and any special qualifications agreed. This was typed on a client's letterhead and forwarded to the contractor for acceptance. (Personal communications, 1998)

CONSTRUCTION PLANNING

The construction project manager monitored the construction process according to the construction programme submitted by the contractor. The method by which it had to be submitted was specified under the preliminary section of the bill of quantity. The item specified the submission of a critical path analysis, manpower schedules for each activity type of activity, plant and equipment and the material procurement schedule. The project manager updated this monthly and the revisions had to be submitted by the contractor for approval. (Personal communication, 1998)

QUALITY ASSURANCE

It is only in recent years that quality management and quality assurance has been in the forefront of construction in Sri-Lanka. Even though quality management was found in the manufacturing sector, it is only now this is given reference to in the construction process in Sri-Lanka. That is ISO 9000 for construction and ISO 14000 for environment projects. However, in this project, it was more quality control that was implemented than quality management. Quality control depended on the specifications for the quality of material used and the standard of workmanship. It was the responsibility of the project manager and the consultants to supervise and it was the responsibility of the contractor to provide the necessary quality under the terms of the contract conditions. Further any special testing required by the consultants such as concrete cube testing or any other testing needed was specified in the preliminary section of the bill. All material and workmanship specified was either according to the Sri-Lankan standards and or equivalent to British standards. In Sri-Lanka, to date quality control is the responsibility of the contractor with the architects and engineers making periodic checks to see that the contractor maintains the quality levels. The architect and the engineer have implied authority to stop and order removal of materials or work that does not conform to the quality standards. (ICTAD, 1992)

POST CONTRACT COST CONTROL

The post contract cost control was both by the project manager and the consultant quantity surveyors. During the construction process it was according to the cash flow submitted by the contractor and agreed by the project manager. After the commencement of construction the contractor submitted the monthly valuation. With the monthly bill the contractor was requested to submit any claim for extra work and variations. The consultant issued variation orders. Once the variation orders were identified, this was submitted to the project manger with the approximate cost for approval. Ideally, the consultant would have to wait till the project manager gave approval for the variation order. In reality, the same variation order was issued to the contractor for quotation simultaneously. When it was submitted by the contractor it was then evaluated by the quantity surveyors based on the unit rates already in the contract bill of quantity or on new rates negotiated and the final amounts agreed was forwarded to the project manager for approval. In the meantime, the contractor was requested to proceed with the work. This made cost monitoring difficult. However, cost monitoring and reporting during construction was done on monthly financial statements prepared by the quantity surveyors. The statements showed the budget for the contract, the actual contract sum awarded, cost of variations approved and the approximate cost of projected variations. However, there were more than 600 hundred variations, which was only completed at the final account stage. This was due to the lack of proper information flow from the site to the quantity surveyors. Periodic cost checks, projected financial statements were the methods used by quantity surveyors for reconciliation of the budget. The final reconciliation was done only at the final account stage. (Personal Communication, 1998)

PROPERTY MANAGEMENT

Property management should be one of the goals of a client. It encompasses establishment of a long-term strategic plan to administer real estate, operation and maintenance of building after commissioning. In order for this strategic plan to be effective the designers must be aware of the effects of the decisions taken by them so that best design and technical options could be used during design stage. However, the only concerns for property management was to abide to property legislation's enacted by the Sri-Lanka government such as the Finance act, the stamp duty act, the town and country ordinance and the urban development authority act for the real estate. (ICTAD, 1992) Requesting of as-built drawings and manuals from the contractor was for the subsequent building management. There was no planned property management strategy for this project. Much thought is not given for property management of commercial buildings and

shopping complexes in Sri-Lanka, however, in recent years, some roles have been undertaken by private real estate companies to collect rent and pay utilities. The maintenance and cleaning is contracted to specialised firms. (Central Bank of Sri-Lanka Annual Report, 1994)

LIFE CYCLE ECONOMY

Life cycle of a property is two fold. One is the life cycle of the objective and the other subjective depending on the various owners owning the property during its life cycle. In this project attention was given to the study of the property market and the preparation of feasibility to judge the risk of the capital investment. Focus was not given to the Life cycle economy of different materials used or the operating systems used in the mechanical services. This lead to replacing of the roof material in the lobby area of the project within few years of commissioning the project thus leading to high replacement costs during operations. The reason was the use of a product that had a short life span in a tropical climate and the non-availability of the required expertise to lay the roofing material.

Maintenance Planning

The only material for planned maintenance operations were the as-built drawings submitted by the various contractors and the manufacturers operating manuals. The maintenance of the building was handed over to a specialised company after commissioning of the project. The tenants were requested to pay an annual fee for such maintenance. This was written into the buyers' contract. However since there was a necessity for a maintenance manual that indicated the rights of the buyer in the use of the property the project manager was requested to prepare such a manual.

EXPERIENCES TO BE USED IN FUTURE PROJECTS

The client was not specific at the briefing stage and did not demand the consideration of economical control systems for property management such as analysing the annual costs, cash inflows and outflows and the preparation of a carefully worked out plan for management of the property. This led to many problems in the maintenance and operating stages. The divided responsibilities of the architectural consultants, the delay in the appointment of a project manager led to numerous problems in client consultant relationships. The project being the second of its kind was a prestigious project constructed in the city centre of Sri-Lanka and the client's expectations from the designers were high quality materials, equipment and finishes so that the product would be marketable while maintaining the cost levels. Even though durability, long term maintenance, reduction of running costs were not stipulated in the design brief, such consideration was expected of the designers. Due to the magnitude of materials used, detail analysis was not carried out thus leading to the use of some material that was not compatible. One other area that was not clear was the cost limits stipulated by the client. This led to project cost overruns.

CONCLUSIONS

A number of key issues surfaced that were important for the success of the project. Some of the issues surfaced were that, various stages of the construction process are inter-linked an in order to achieve the project goals. In order to achieve the goals there should be teamwork. The various actors in the process must realise this and work as a team. If not, the inadequacies in one stage will lead to another creating a chain reaction. This was seen with the divided responsibilities of the design consultants. Inadequate briefing from the client was another issue that became apparent in this project. Therefore, it is important that, firstly, clients must be specific at the briefing stage. There should be adequate time for briefing so that careful

analysis could be done to obtain the best option. The process must continue with proper monitoring of cost quality and time till the project is completed. Secondly, due consideration must be given by all those concerned in the project, to a structured and systematic approach to design, construction and property management. In conclusion, the lessons to be learnt is that, the success of any project depends on the successful co-ordination of all activities within the project, the "right mix" of participants with the appropriate organization structure having the ability to corporate. Further realistic methods must be implemented to monitor the cost and there must be constant flow of information from the site so that cost monitoring could be made easy. Structured quality assurance programme must be implemented to avoid wastage, breaking and remaking. This would then bring about a successful investment to the prospective client during the life cycle of the project.

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FINANCIAL RISK MANAGEMENT FOR FUNDING AGENCIES ON MAJOR CONSTRUCTION PROJECTS

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ABSTRACT

This paper examines in detail a now proven methodology for managing the interests of lenders on major construction projects. By way of a case study approach we detail the means by which lenders' financial controls are successfully instituted and monitored on major construction projects within New Zealand. The requirements of lenders on major projects has been undergoing a redefinition and this paper demonstrates the increasing demands being placed on the quantity surveyor or cost engineer to provide the fiscal safeguards which these clients require.

Keywords: funding, certification, due, diligence, risk, mitigation

INTRODUCTION

Project Audits and Cost to Complete Certification are not new to quantity surveyors. Most practices in New Zealand would have experience of providing monthly reports to funders as a double check that their exposure is manageable.

The requirements of funders on major high-risk projects are now taking on totally new dimensions. Their requirements are becoming increasingly more attainable as quantity surveyors and cost engineers gain experience in funding certification and the banking industry and can translate that experience into appropriate products and services. In part this is driven through researching clients' requirements and tailoring a service to meet and exceed those requirements and consequently enable the funders to increase their level of funding or to fund at risk levels not normally envisaged.

THE CLIENT RELATIONSHIP

Collectively, as Quantity Surveyors and Cost Engineers, our clients for Funding Certification on major construction projects are the Lenders. We are their trusted advisers who provide expert advice on the property and construction industry processes. We are their eyes and ears and as such have to be able to speak their language, that of the banking industry, as well as that of property and construction procurement.

In the client's eyes we are engaging in a process of applied risk identification and mitigation. A client bank or institution funding a major project primarily sees itself as being the potential owner of the development being funded. If the developer defaults on the loan the funding institution usually holds as its ultimate form of redress, the right to title on the property or a guaranteed process by which the project can be completed to enable realisation of the debt.

The majority of such funding institutions would not see themselves as property owning businesses; consequently their interests would lie in disposing of the property at a price sufficient to recover their outlay.

The service that they require is one which best protects all of these interests.

SCOPE OF SERVICES

Due Diligence Audit

The first part of any funding certification is the due diligence or initial audit which is carried out to provide the funders with assurance that the project is indeed viable and that in the event of the developer's demise, the funders have a saleable asset against which to recover their funds. It is also the benchmark against which ensuing financial performance is measured.

The scope of works offered to funders includes:

- Detailed examination of the development cost especially:
  - Review estimates of construction costs against the contractors tendered or negotiated cost
  - Reasonableness of the level and timing of preliminaries
  - Review of contingent provisions. This is done through Quantifiable Risk Analysis (QRA) techniques.
  - Review all other costs within the development budget
  - Comprehensive QRA to determine probable outcomes of all costs.
- Resources and Building Consents
  Critically review all Resource and Building consent documents and conditions to ensure they can be met and identify any potential risks.
- Conditions of Contract
  Extensively review the total contract documentation including all transaction and project documentation and briefs to highlight any potential risk to the Developer and Lenders.
- Ensure that all requirements pertaining to the development have been satisfied within the contract documentation and obtain a sign-off on the project brief and other documents.
- Review and report on the adequacy of services and technical innovation to ensure that market expectations are met.
- Review and report on the tender and ascertain reasonableness of proposal for the scope of work to enable cost to complete mechanism to operate correctly
- Review and report on proposed project reporting methods and procedures.
- Review and report on any alterations to drawings subsequent to Sale and Purchase agreements becoming operative.
- Review and comment on the construction and development programme.
- Peruse all documentation relating to the development to satisfy ourselves on the lenders behalf that the amount of the loans and the programme allowed are sufficient to undertake the development in accordance with the plans and specifications.
- Review and report on the Management procedures and personnel involved in the project including all consultants.
- Review and report on the capability of the contractor to fulfil the obligations of the contract.

This is an extremely detailed and in-depth audit of the project. It often involves many man-weeks of senior time to fully evaluate the development. This may also involve working with real estate

people, valuers, solicitors and other specialist consultants where necessary to satisfy all requirements of the due diligence. This initial due diligence certification will be structured to meet the varying requirements of individual funders.

Invariably the quantity surveyor's internal knowledge of the industry as a whole and personnel involved can be of valuable assistance to funders at an early stage when they are carrying out a preliminary review of funding prior to credit papers being presented. We can often prevent funders wasting unnecessary time considering funding for a project that will not be viable.

The end product of this research is a Certificate to the lenders that unequivocally states our opinion as to the risks faced by the lenders and the ability to mitigate those risks or a report of recommendations that should be incorporated into the project requirements to satisfy our requirements to sign off the project.

Monthly Certification

The prime concern of the lenders during the construction process is ensuring that the money available is at all times sufficient to complete even if the developer or the contractor was to fail during the course of the project. At no stage may the current cost to complete the project, including all variations and changes to project requirements, exceed the funding available. This is monitored on a category by category basis, reporting against the feasibility approved for funding. If any category cost to complete exceeds funding available for that category then expenditure against contingency has to be approved and monitored monthly. The funder must approve all expenditure additional to the original feasibility.

The key indicator, which the lenders rely on, is the estimated cost to complete. We certify that the estimated cost to complete the development, as at the date of the certificate, will not exceed the amount of the loans that will remain available for drawing.

The monthly certification report becomes a sizeable document that can include:

- The cost to complete certificate
- Our certification that there has not been material change to the development either carried out or authorised without the consent of the lenders.
- A review of all relevant correspondence in respect of cost and time overruns and submit to lenders for approval.
- Certification that the development is being carried out in accordance with the approved plans and specifications.
- Certifications from separate building consultants (architects and engineers) that the construction of each part of the development has been carried out to a proper and workmanlike standard and manner.
- Certification that the estimated date of completion of the development and the construction timetable is achievable.
- A detailed commentary on progress against programme, notification of delays and extension of time claims.
- Review the building owner's Monthly Report prepared by their project manager and comment on the administration of the Contract by the parties.

The monthly Certification report is accompanied by a signed drawdown advice which sets out the full financial details of the drawdown, cost to complete and a range of associated key indicators. In addition a wide range of processes that cover the confirmation of payments to subcontractors and suppliers are implemented.

The process of continuity guarantees requires the subcontractor to complete the project directly for the funders should the main contractor default on the contract. The process of ensuring all monies drawn down from the funder have been applied to satisfy all the project debts on a month by month basis ensures that a main contractor cannot use funds from this project to support other projects.

A major requirement of Project Audits is to ensure that the building as designed and approved for funding is in fact completed to the level of appointment to satisfy all lease and sale agreements thus enabling the funders to satisfy their debts. It is also necessary to satisfy the funders that no element of developers profit is paid out until all funder's requirements have been satisfied.

Completion Stages

In the lead up to practical completion and during the completion phase the following is carried out:

- Review and report on Practical Completion plans and risks and performance of the Borrower in achieving Practical Completion as scheduled.
- Check and assess the completed parts of the building for compliance with the Master Agreement and Sales Contracts to ensure operation and settlement can be effected.
- Provide a Certificate of Practical Completion to the lenders
- Assist with arranging for as-built records and project accounting data to be provided to the lenders.
- Review defects lists and monitor completion of work as necessary to satisfy Sales Contracts, Master Agreements and Building Contract.
- Assist with the settlement process and documentation as required to satisfy the obligations of the Borrower under the Transaction Document.

Throughout the project we have an over-riding obligation to notify the Lenders immediately if we become aware of anything that:

- Makes any previous certificate / statement incorrect
- Will delay practical completion
- Will result in a variation
- Will increase the cost to complete over budget
- We consider in the context of the development to be of material interest to the Lenders
- May involve a breach of any transaction documents.

PROJECT RELATIONSHIPS

In providing the service to the Lenders, our contractual relationship is entirely with them. However in order to access and validate the information required to provide this service it is necessary that we have a contractual relationship with much of the construction team.

Generally this is not a problem - it is obviously in the interests of the developer and his agent - possibly a project manager - to ensure that we are included within the information loop and the respective appointments and contracts can reflect this.

The project consultants - including architect, engineers, and quantity surveyors - have often been appointed well in advance of our arrival on the scene. We are reliant to a certain degree on the reports that they produce. However these consultants have no contractual link to the Lenders or to us as the lenders representative.

We have introduced Deeds of Covenant that create a duty of care between any consultants, whose advice we have to rely upon, and ourselves.

The keys to this document are the following Clauses:

> *In the performance of their obligations Maltbys will be relying on reports, information and material provided to Maltbys by the Consultant produced by the Consultant in the discharge of its obligations to the owner and the contractor.*

Maltbys wish to have the Consultant acknowledge and agree that the Consultant owes Maltbys a duty of care and other obligations in relation to the reports, information and material provided to Maltbys and relied upon by Maltbys.

The full Deed of Covenant provides security to the Lenders that they, through us, are able to rely on the advice of the Consultants as professional advice. It also provides them with an ability to seek legal remedies from the Consultant and their Professional Indemnity insurers as if the Consultants were providing professional advice directly to the Lenders. This redress would be available through common law but is faster and more effective when incorporated into a contract.

FEES AND CHARGES

The fees for funding certification are generally negotiated directly with the lenders, although in the final analysis the borrower or developer will pay them for

To be successful in offering such a service it advisable to use very senior personnel who can relate directly to the banking fraternity and who have the experience and confidence to be able to make judgement calls.

As can be seen from the scope of work above, the lender can require a very extensive service and it is not unusual for the funding quantity surveyor's fee to exceed that of the project quantity surveyor (excluding BQ production).

CONCLUSIONS

In New Zealand increased globalisation has resulted in funders, developers and contractors from overseas playing a major role in the market. This applies now to most countries in the world.

The net effect is that funders in particular are operating in markets in which they have little hands on experience. In order to identify and manage their risk they need professional advice that is tailored to suit their particular requirement.

What the lender's quantity surveyor can bring to the table is that professional service and downstream benefits that include:

- Greater surety of outcome
- An over-riding discipline to the total development process
- A rigour that is often not present in development projects - eg checking of the sale and purchase agreements
- Additional assurance to the end owner that he will get what he has commissioned.

Financial Risk Management for Funding Agencies on Major Construction Projects has international applications on a wide range of project types including:

- Private development projects
- Public development projects
- BOOT and privately funded infrastructure works

It is a further tool for the quantity surveyor and cost engineer in project risk management and mitigation.

PROJECT COST MANAGEMENT: YESTERDAY, TODAY, TOMORROW

Michael Hodgetts
Fellow of the Australian Institute of Quantity Surveyors and President of this Institute.

ABSTRACT

This paper looks at some key aspects in the development of project cost management which occurred during the author's career of some 46 years. Cost Management or Quantity Surveying is financial management of the construction process. Do not talk about cost control. You cannot cost control. Orderliness is the essential characteristic of the good professional who is trained to offer risk management. The Bill of Quantities is a hypothetical construct and can be used for many purposes, tendering, tax, insurance, research. We are consultants to property and construction, tomorrow offers us the opportunity to be communications manager in design and construction.

Keywords: Bills of Quantities, Cost management, Quantity Surveying

YESTERDAY

As long as there has been Building Construction, there have been individuals who have been interested in the cost of construction, the methods of construction, the management of construction. Sometimes they know about all three. in the USA some of these operatives are called Cost Engineers, Cost Estimators, Project Managers, Schedulers and Specification Writers.

In other places they might be called Quantity Surveyors. Your conference suggests they might be called Project Cost Mangers.

Whatever the name of the animal, my preferred definition for what we do is the Financial Management of the Construction Process.

When we are building for investment or sale, Building to Make Money requires the management of risk. Risk requires detailed planning, management and control.

This conference is entitled Project Cost Management. I am very pleased you did not call it Project Cost Control. Some years ago when I was the quantity surveyor for a large office building in Sydney, the inflation rate in the building industry was very high and at the same time the Australian Dollar fell very low. We had materials that were coming from overseas glass from America, services equipment from Japan, stone from Italy. The fall in the Australian dollar added something like sir million dollars to this office building.

The project manager said to me - you said you would control the cost. - Yes.

- You did not control the Australian dollar - I did not say I could control the dollar.
- But in your proposal to me, which the client accepted, you said you would control the cost. You did not control the cost. You did not exclude currency fluctuations.

In earlier years some Architects were good at design but asked the builder about cost. It was easy for the builder to make extra money if the Architect changed his mind or some materials were not available. What was needed was change control, and someone less artistic, more business like, perhaps not an Architect, perhaps a clerk or someone with technical knowledge like a specification writer. Some builders' estimators could measure bids for several builders, they could advise on design changes1 even contract changes.

One firm in Reading in England began as carpenters and joiners. Like a lot of builders who had joinery shops, they also made wooden coffins. It's only joinery. Not much different from cupboards and wardrobes. But you have to measure joinery very accurately, not just feet and inches but fractions of an inch, or decimals. And you have to have an ORDER of entering the dimensions into your note book so other readers know which dimension is which.

Project Cost Management.

There always seems to be change. Costs go up.

So if there is always change, was the bill which was used for tendering, still worthwhile? Of course. But it has to be understood that it is a document at a specific time. The bill describes the building on the drawings, in the specification, and in the architect's mind, at the time of tender. It is a hypothesis at that time. It is a mental construction at that time.

THE BILL OF QUANTITIES IS A HYPOTHETICAL CONSTRUCT

When you grasp this definition, you can see the potential of the Bill clearly and it is a much more useful document than you ever dreamed.

It can be used as a basis for TENDERING and as a basis for CHANGE CONTROL. But there are at least nine virtues of the bill:

1. Use for tendering to define the scope of the works
2. Introduce competition from approved select builders
3. Use for variations and change control
4. Use for interim payments to assess work in progress
5. Analyse the priced tenders and use for future cost planning
6. Price the bill five years later for cost research, inflation and trends
7. Price the bill (whenever) to establish replacement cost for insurance purposes
8. Analyse parts of the tender bill for tax depreciation
9. Extract parts of the bill for later maintenance and refurbishment

I call this 'The Bill of Quantities has Nine Languages'.

TODAY

Much of what I have said under the heading of YESTERDAY still applies TODAY. There is an old Chinese saying 'If you know where you have come from, you know who you are. If you know who you are, you know who you are going to be.'

One of the most innovative QS Firms in Britain developed their skills to include Facilities Management. The senior partner described it to me like this. We believe that Facilities Management is the Kite. Quantity Surveying is the Tail

Major developers have to possess a far greater range of skills when they put a project together. Buy the land, arrange the approvals and possible rezoning, arrange the finance, appoint and control the designers, manage the design process within space quality and cost parameters. Then secure trade prices, get the construction started, continue to control the design, quality, function and cost. Complete the development, create a new property vehicle with partners in private and government funds, to own and operate the facility. Sell the completed project at a successful prearranged price, into the development vehicle.

Project Cost Management

Guarantee the rental returns for ten years with any shortfall being made up by the developer/vendor. If this sounds like magic, a very tall order, this is the recipe for future major construction.

In Australia from about 1992 we had a big slump in the Construction Industry. I had just become group chairman and there were some thirty companies in the group. I had to think about TOMORROW as well as worrying about TODAY.

It seemed clear to me that as well as survive very difficult times, I needed new objectives. These became my future plan:

1. Identify the future leaders of the Group and protect and nurture them
2. Identify new services we could offer in existing property as well as new construction
   - truly become consultants to property and construction - tax, insurance, financial management, asset management, building quality assessments, value management.
3. Open ten new offices somewhere else in the world where the building cycle was in demand.

When I talk about TODAY I remember what I felt YESTERDAY, what we did to protect the firm. Quantity surveying, the services we offer in measurement and costing will always be needed from someone. The role we play in bringing ORDER and HONESTY are valued by every right thinking client.

Some years ago the AIQS put under its logo on the Institute letterhead the word INTEGRITY. It sums up for me the essential quality the professional QS brings to Project Cost Management. An ordered mind, a logical mind, a well trained versatile mind, a mind trained in judgement1 an honest mind, a person of highest integrity.

In Orlando in USA at the American Cost Engineers Conference the key speaker was the head of Bechtel, worldwide engineers who can construct anything. They undertake billion dollar projects, infrastructure, oil pipelines, airports, major construction. Re told us that their contracts were so big that when they tendered they had to bet the company

How would you feel about betting on your company when the stakes are your company? Re said the most important man he turned to in bidding1 was his cost estimator or cost engineer. Re needed Risk Management.

This Bechtel chief said another impressive thing about Cost Engineers (Cost planners, Cost Managers).

- When I am planning a major new project,
I want to know where the cliff is.
- NOT HOW FAR I FELL.

In truth we are very good at telling our clients in great detail where and why things went wrong and how much it is going to cost, in other words how far they fell.

TOMORROW

You can see it is all one story. If the Bill of Quantities is not used universally, parts of it are buried in every job. Measurement and pricing. It will never change. Never has changed.

What changes is the form and shape, perhaps the title of the person responsible. Today we hear about global business, global strategies, global building. The Internet.

The old questions are still the important questions. How does the builder manage his risk, can he share his risk with his client. Can he still make money?

Let me list some of the things that the professional of today does in whole or in part, will do tomorrow. Evolution of quantity surveying vertically and laterally:

Management consultancy, counselling, tax, insurance, dynamic and effective cost planning9 viability assessment, risk management, assessment of risk premiums, costs to complete, monitor the contractor's role in modification of design to accord with his risk. Development of expert skills in large retail projects, in hospital planning and financial management. Project monitoring for other parties such as the major finance entity.

Asset management, audit and check overview, security of payment, quality assessment, value management, refurbishment, cost management of building services, computer services.

We have to decide how much and how quickly we change our Systems and methods. Already we are familiar with the concept and use of voice mail, being able to telephone from anywhere to pick up our recorded messages is a miracle. We can send the minutes of a meeting to all parties simultaneously by email. That's the easy Part.

It is only improved communications but what an improvement. I felt sorry for the architects of a major Sydney project for a Hong Kong client, when the drawings were sent to Hong Kong by email for checking by the client's Hong Kong architectural advisor.

No expensive trip for the project architect to Hong Kong for a week, flying business class, and being entertained in style. But I noticed that the client's team still managed to make regular visits to Sydney.

What about the Virtual Organisation? You probably know more about this than I do.

The Virtual Organisation is a distinct intra and inter organisation form, that provides AGILITY and RESPONSIVENESS in competitive and changing business environment.

Different words but in fact we can understand that our business framework consists of requirements and satisfiers which in conventional organisations are hard wired together.

Switching is the concept that allows more dynamic relationships, promotes systematic building of temporary relationships.

Project Cost Management

The current competitive business environment requires quick and accurate exchange of knowledge and co-operation within and between organisations.

We know there will be alternative ways to solve problems, to use internal and external resources creatively, to form specialised competencies from multi-disciplinary teams. Here is the great opportunity for our profession:

To form dynamic relationships such as I spoke of offering critical and essential proactive advice.

Tell me where the cliff is, not how far I fell. And to help guarantee the end result.

It is fifteen years since the concept of consortium reporting was first put into place in Sydney with all major consultancies contributing to the project manager's central monthly report. By linked computer.

It is fifteen years since I established remote measuring surveyors at home, working as self employed consultants measuring to a central computer.

Now when you ring a bank, an airline company or a message company, you may be speaking to a consultant in Singapore, Adelaide or Brisbane. Not down the road. My colleague in Christchuich7 New Zealand, had such a small office that when he went out, he night switched the phone to Wellington on a different island because they had switch bard operators.

And lastly we must touch on changes in data processing, design methodology, management systems. Will we be able to prepare cost plans from a CAD system without measuring? It depends on what data is supplied and whether it fits with what we want. Will the QS forget how to measure? How can you get Quantities from CAD? Different architects and engineers use different systems. What is Inter-operability? You may have heard of IFC files.

The IFC for a door knows everything about that door, the cost plan, the design, the current drawing. And any concept can become an IFC.

The professional QS will have to learn how to adjust an IFC to the purpose he seeks, to get information from the IFC in a relevant way. If areas for example, are calculated differently he will know how to adjust this from his experience of working with the system, how to advise the computer programmer where adjustment is necessary.

It's a bit like checking the concrete beams for holes through for service pipes. What is the right place, will it work? It's a bit like coordination of ceiling plans, floor plans, the staircase plans, the services plans. Do they fit together? More than ever the Qs will take detailed notes at meetings as he does now, check what is going on, keep the information on target, help the team to cooperate.

These are my thoughts on Yesterday, Today, Tomorrow. I wish you success in your discussions and in your careers.

CAN CLAIMS AND DISPUTES (IN CONSTRUCTION CONTRACTS) BE PREVENTED OR REDUCED?

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ABSTRACT

The topic of this paper is claims and disputes in construction, mainly from the perspective of the client in the context of the client / contractor relationship. The causes of claims and disputes are examined from the perspective of transaction cost economics (TCE) theory due to its focus on contracting problems and in particular its suitability for complex, long-term and dynamic relationships which are found in construction contracts. Consideration of TCE theory in the context of construction suggest that the root causes of conflict, claims and disputes are:

- Contractual incompletedness; and consequent "post-contract" adjustments
- Asset specificity, mainly in the form of the client's investment in respect of purchase / assembly of the land for the project and the costs of design / construction.
- Opportunistic behaviour, in particular on the part of the contractor.

A brief case study drawn from Hong Kong's Airport Core Programme is used to illustrate the presence of contractual incompletedness and opportunism. Measures for preventing / reducing the incidence of claims and disputes are proposed. Conclusions are drawn that the actual incidence of claims and disputes is largely governed by the client in determining the balance of his priorities for the project and his consequent selection of procurement system, and design and construction teams.

Keywords: Conflict, claims, disputes, transaction cost economics.

INTRODUCTION

To consider a response to the above question it is necessary to reflect upon the possible causes of claims and disputes and the extent to which those causes can be addressed.

A review of the literature reveals confused usage of basic terms. The terms "conflict" "claim" and "dispute" are used separately or in pairs and frequently without clear indication of the precise meaning of each use. There is often a lack of clarity as to whether the researcher is referring to "claims" per se (i.e. claims which are resolved between the parties and do not therefore become disputes), to "disputes" (i.e. those claims which are not resolved and graduate into disputes), or to both "claims and disputes" (that is, the "conflict spectrum" - see Figure 1.)

A number of writers, however, adopt similar broad definitions for these terms.

Gardiner and Simmons (1992) define conflict as "any divergence of interest, objectives or priorities between individuals, groups or organisations".

A claim is defined by Powell-Smith and Stephenson (1989) as "an assertion of a right to money, property, or a remedy and can be made under the contract itself; for breach of the contract, for breach of a duty in common law; or on a quasi-contractual basis."

A dispute is defined by Brown and Marriot (1993) "as a class or kind of conflict, which manifests itself in distinct, justiciable issues. It involves disagreement over issues capable of resolution by negotiation, mediation or third party adjudication."

Brown and Marriot also cite the definition given by D. Foskett QC in The Law and Practice of Compromise: "An 'actual' dispute will not exist until a claim is asserted by one party which is 'disputed' by the other." (Brown and Marriot 1993)

In similar vein Fenn et al (1997) suggests that "Conflict exists where there is an incompatibility of interest. When a conflict becomes irreconcilable and the mechanisms for avoiding it are exhausted, or inadequate, techniques for resolving the dispute are required."

Kumaraswarmy and Yogeswaran (1997) refer to the UK Institution of Civil Engineers arbitration procedure which states: "A dispute can be said to exist when a claim or assertion made by one party is rejected by the other party and that rejection is not accepted."

Combining these definitions with relevant terminology in standard forms of contract and recognised construction industry practice, it could be said that a conflict occurs at the same point in time as when a notice of a claim is given and exists until the claim or dispute is resolved.

It is, of course, theoretically possible that a claim submitted by the contractor and immediately accepted and agreed to, without amendment, by the Architect/Engineer would not necessarily give rise to conflict. Equally, it could be argued that a conflict comes into existence in the mind of the Contractor at the point in time when he becomes aware that the relevant event has occurred and a potential claims situation exists, even though the Architect/Engineer may be unaware of it. However, for all practical purposes, and certainly of the purposes of this paper, it is assumed that the genesis of a claim and a conflict are synonymous.

Figure 1 combines these definitions of conflict, claim and dispute and illustrates the "spectrum of conflict" which ranges from the notification of a claim at one end of the spectrum, to the resolution of a dispute at the other.

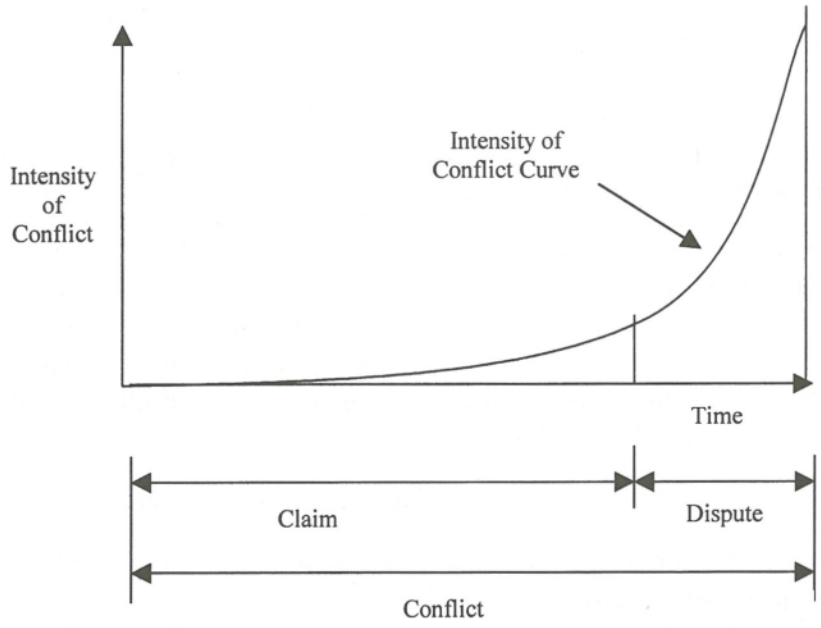

Figure 1 The Spectrum of Conflict

The "intensity of conflict" curve illustrates the increasing strength and intensity of feeling between the parties as the conflict progresses through the various stages of a claim which, if unresolved, develops into a dispute and proceeds through the various dispute resolution stages until it is ultimately resolved. (A model depicting the increasing cost of a conflict through the same stages would be more or less identical to the "intensity of conflict" curve).

CAUSES OF CONFLICT, CLAIMS AND DISPUTES: A TRANSACTION COST ECONOMICS PERSPECTIVE

In recent years, four studies in particular: Doree (1994), Alsagoff (1996), McDermott and Alsagoff (1996) and Yates (1998) discuss the application of transaction cost economics (TCE) theory to the issue of causation of conflict, claims and disputes in construction.

This approach suggests that the root causes of conflict, claims and disputes are contractual incompletedness and opportunism in the presence of asset-specificity.

Contractual Incompletedness

Many contracts which take place over an extended period of time can be described as incomplete in the sense that, at contract formation (ex ante), the obligations of the parties cannot be fully and unambiguously specified to take account of all future "states of the world" which may be encountered during contract execution (ex post). In theory, a construction project tendered on the basis of a fully completed design (or, in the case of design/build procurement, a full and precise statement of the Employer's Requirements), having no errors or omissions in tender documentation and requiring no changes or variations during the construction phase, could be described as a "complete" - that is, fully contingent - contract.

In reality, however, in view of the complexity of the construction process and time necessary for overall delivery, all but the smallest of projects are inevitably incomplete.

In "traditionally" procured projects contractual incompletedness is usually manifest in one or more of three categories:

1. At contract formation stage in the form of Prime Cost Sums (PC Sums), Provisional Sums, Provisional Quantities, and the like, all of which are "adjusted" during the construction phase depending on the client/design team's actual requirements.

2. A contractual mechanism - namely, the right to instruct variations - which allows the client/design team optimum flexibility in decision-making (either by leaving decisions as late as possible and/or changing decisions made previously).

3. Ambiguities, errors or omissions in the ex ante contract documentation, which come to light ex post, necessitating clarification of the client/design team's requirements and leading to ex post "adjustments". (Usually classified as variations).

According to TCE theory there are three factors which give rise to contractual incompletedness: bounded rationality; risk and uncertainty; and complexity.

Bounded Rationality

Bounded rationality is described as the cognitive constraints on humans, which prevent the preparation of fully contingent contracts at contract formation stage. The constraints are limits of knowledge, ability, experience and competence, which are exacerbated, on occasions, by limited time.

Risk and Uncertainty

Uncertainty as to future "states of the world" can also influence the nature and extent of post-contract "adjustments" whenever contingencies arise which, in accordance with the contract, are at the risk of one of the parties or shared between them. (For example: injury to persons and damage to property, which are usually insurable; inflation; shortages of labour and materials; adverse weather conditions; unforeseen ground conditions; and other matters, which are wholly beyond the control of the parties).

Complexity

The complexities of construction compared with other industries (particularly manufacturing) are summarised by Casson (1987):

- Unlike most manufacturing, construction output is normally a sequence of "one-off" projects each of which is customized because of the requirements of the particular client and the idiosyncratic constraints of the particular site.
- Most construction work takes place "out of doors" and is, therefore, subject to the vagaries of the weather. In this respect construction is like other weather-related activity such as agriculture and tourism.
- Intermediate inputs are immobile. The division of labour within construction creates many separate tasks within the production process. Different tasks call for different specialist skills, as in manufacturing. However, unlike manufacturing, most of these tasks have to be carried out on the same site, because their output is embodied continuously and directly into the structure. Subcontractors do not, therefore, work on their own premises but on the main contractor's premises. Moreover, they work in close proximity to each other. Unlike manufacturing, therefore, subcontractors work "under the eye" of the main contractor and "under the feet" of other subcontractors.
- Construction is labour intensive. The division of labour creates many activities for which the only input of any significance is labour itself.
- Many activities cannot be begun until others have been completed. Punctuality in starting and completing each activity is therefore crucial for the prompt completion of the overall process.

Opportunism

Contractual incompleteness ex ante sets the stage for potential problems ex post. When events/ circumstances arise that are not fully and unambiguously covered by the contract provisions, one or both parties may have incentives to behave "opportunistically" by taking actions that will increase the costs or reduce the revenues of the other party.

Opportunistic behavior involves making "false or empty, that is, self-disbelieved, threats and promises in the expectation that individual advantage will thereby be realized." (Goffman 1969). It involves subtle forms of deceit and also includes stronger, more blatant forms of behaviour such as lying, stealing and cheating. The notion that, in certain circumstances, "contractual" man will behave opportunistically is entirely consistent with one of the basic concepts of neoclassical economic theory, namely "the motivating force in the economic system is self interest." (Galbraith and Salinger 1981).

More generally opportunism refers to the incomplete or distorted disclosure of information, especially to calculated efforts to mislead.

TCE theory does not insist that individuals (and/or firms) are opportunistic continuously, or even largely given to opportunism. Williamson (1985) merely assumes that "some individuals are opportunistic some of the time".

There appears to be a spectrum or scale of opportunism, with nil or insignificant opportunistic behaviour at the low end of the scale and extreme behaviour, possibly involving criminal activity, at the top.

It may well be that a "reputable" contractor, in normal circumstances on a contract, which promised a reasonable margin of profit, would be placed on the lower reaches of the opportunism scale. However, faced with the prospect of a significant loss - due, for example, to the occurrence of an event which is at its sole risk - the contractor, at a stroke, could jump several notches up the scale to such an extent that it would be prepared to spend significant additional sums of money on legal advice and "take its chances" with a full arbitration.

Theoretically, it is possible that a claim genuinely made by one party could genuinely be disputed by the other involving no opportunistic behaviour by either party. In practice, however, contractors' claims are often opportunistically inflated, exaggerated or even spurious and clients (and their staff/ consultants) frequently respond with reciprocal opportunism, by rejecting contractors' claims out of hand.

Asset Specificity

Transaction cost economics theory assumes that markets are competitive ex ante (that is, there are many buyers and sellers). Opportunism can emerge ex post because certain characteristics of the transaction give one or both of the parties some "monopoly" power when certain contingencies arise. The primary source of monopoly power is the presence of transaction-specific investments (asset specificity). Given contractual incompleteness, the higher the levels of asset specificity, the greater the potential for opportunistic behaviour.

Transaction-specific investments generate a series of potentially appropriable "quasi-rents" equal to the difference between the value in the use to which the investments are committed and the next best use. The presence of transaction-specific investments creates incentives for one party to behave opportunistically and "hold up" the other ex post, which can lead to conflict and "costly haggling". (Klein et al 1978).

Masten et al (1991) identify a particular type of asset specificity, temporal specificity, which is described in the context of shipbuilding and construction where the need for precise scheduling of activities raises the potential for strategic hold-ups by key contractors/subcontractors. Williamson (1996) subsequently describes temporal specificity as "akin to technological non separability and can be thought of as a type of site specificity in which timely responsiveness by on-site human assets is vital."

TCE theory identifies contractual incompletedness as the key to opportunism. Without contractual incompletedness construction contracts would be fully contingent, and there would be nothing for the contractor to behave opportunistically about (except for opportunistic cheating on quality/specification requirements, the subject of which is outside the scope of this paper). The presence of transaction-specific investments by one or both parties is a condition precedent to opportunism. "Absent asset specificity, and the parties go their way whenever transactional difficulties ensue". (Williamson 1975).

From the perspective of the client, the assembly/purchase of the land for the project and the cost of design/construction represent significant transaction-specific investments. The client cannot realize the return on this investment until the project is completed. The time taken for design and construction of the project, is thus, a critical factor. The threat of delay to completion of the project, therefore, gives the contractor significant potential for hold-up/opportunistic behaviour.

Transaction-specific investment by the contractor is less apparent, and possibly varies from time to time during the construction period depending on the incidence of payments by the client. For example,

one month into the construction period, the contractor has invested in tendering costs and site-team assembly, mobilisation of plant and equipment and site offices, but has not yet received the first interim payment.

Masten et al (1991), however, express the view that, unlike manufacturing, investment in plant and equipment used in construction is less likely to be specific to a particular contract. "To the extent that each construction project takes place on a unique site, the assets themselves are more likely to be mobile ... and adaptable for use in varying applications". Nevertheless, the purchase of specialized equipment (such as a tunnelling machine designed and manufactured for a specific project) obviously involves substantial transaction-specific investment by the contractor. However, the hold-up potential afforded to the client by such asset specificity is reduced progressively as work advances and interim payments are made. Any advance payment or lump-sum payment made when the particular item of equipment is mobilised on site further diminishes the client's hold-up potential.

In view of the imbalance in transaction-specific investments, the contractor's potential for opportunistic behaviour and hold-up is significantly greater than is that of the client.

CASE STUDY - HONG KONG'S AIRPORT CORE PROGRAMME

In 1989, the Hong Kong Government announced the intention to construct Hong Kong's new airport on the northern coast of Lantau Island at Chek Lap Kok, together with related infrastructure, all of which was to be completed in 1997. Upon opening, the new airport would be capable of handling 35 million passengers and 3 million tonnes of cargo annually.

The Government of the People's Republic of China, which was due to resume sovereignty of Hong Kong from Britain in 1997, expressed concern at this announcement mainly because it had not been consulted and, in particular, was apprehensive that the future Government of the Hong Kong Special Administrative Region would inherit potential cost and time over-runs and the related debt.

After a series of high-level meetings between the British and Chinese Governments, a Memorandum of Understanding, which confirmed China's support for the new airport and it's related infrastructure, was agreed and signed in Beijing by Prime Ministers John Major and Li Peng on 3rd September 1991.

The Airport Core Programme (ACP) was an unusually large scale and complex undertaking, the primary objective of which was the procurement of the new airport at Chek Lap Kok, together with extensive supporting infrastructure comprising reclamation, new expressways, tunnels, bridges and a completely new railway system connecting the new airport with Hong Kong's central business district.

Due to the delays in obtaining agreement between the British and Chinese Governments completion dates were modified such that the opening and full operation of Chek Lap Kok and the airport railway took place in July 1998. The remaining seven ACP projects together with the Western Harbour crossing, were completed on programme in 1997.

The following article, which appeared in the Sunday Morning Post on 8th June 1997, illustrates both contractual incompletedness in the form of "design changes, schedule variations and delays" and opportunism by the contractor in "demanding millions to finish their contracts on time". Reference is also made to an earlier "$1.9 billion payout" which was evidently "paid despite little supporting paperwork," suggesting a negotiated settlement of earlier claims and illustrating the significant "hold up" potential on the part of the Contractor.

Chek Lap Kok Builders want $1.6b for extras

Building contractors on the $12 billion passenger terminal at Chek Lap Kok are claiming an extra $1.6 billion from the Airport Authority - just nine months after a $1.9 billion payout for other added costs.

The Sunday Morning Post understands the claims, as a supplemental agreement to the initial contract, have just been lodged with the authority by BCJ, the Britain-China-Japan joint venture responsible for construction of the terminal.

They cover design changes, schedule variations and delays which have arisen since a previous supplemental payment was agreed last September.

"The group got the building weather-tight just about on schedule while getting other elements ahead of schedule. It is doing a good job, but there is a cost to that," an on-site source said.

BCJ consists of Amec and Balfour Beatty from Britain, Kumagai Gumi (HK), China State Construction Engineering and Maeda of Japan.

In September, BCJ and AEH - the building services installer - were paid $1.9 billion to settle outstanding construction wrangles on the project.

The payments angered legislators who demanded that senior authority executives give a full explanation for them.

The wrangle recently resurfaced after suggestions the claims were paid despite little supporting paperwork setting out a precise cost schedule for the delays and other problems suffered by BCJ and AEH.

There also have been allegations the authority is being "held to ransom" by contractors demanding millions to finish their contracts on time.

The authority's corporate development director, Clinton Leeks, said the initial supplemental agreements were made at an extremely high level in both the authority and the contractors.

A second newspaper article from the South China Morning Post of 12th March 1998 gives overall ACP data on numbers of claims submitted and resolved to date; the values actually agreed as compared with the much higher values originally claimed; further illustrating the scale of contractors' opportunistic behaviour on the ACP.

Large contract claims 'usual'

Hefty claims are a natural part of large-scale construction contracts, a senior official said.

In a written reply to Eric Li Ka-cheung, acting Secretary for Works Lee Shing-see said 20, 923 claims against 152 airport contracts had been received.

According to the Quarterly Report on the Airport Core Programme Projects submitted to the Finance Committee, the Airport Authority and the Mass Transit Railway Corporation had resolved 6,047 claims at a cost of $2.87 billion against an original claim amount of $10.8 billion by the end of December, leaving 14,876 claims unresolved.

"Given the scale, complexity, multiple contractual interfaces and tight programme [of airport core projects], the number and amount of claims submitted are not unusual," said Mr Lee.

Delays in the possession of sites, variations in design and limitations on certified construction methods contributed to legitimate claims.

This second newspaper article illustrates not only the nature of the contractors' opportunistic claims strategy - whereby initial grossly inflated/exaggerated claims are submitted which are subsequently reduced significantly as part of claims evaluation and negotiation - but that this opportunistic behaviour is considered by a senior government official, the acting Secretary for Works, as "not unusual".

MEASURES FOR PREVENTING/REDUCING CLAIMS AND DISPUTES

Contractual incompletedness and opportunism are identified as the root causes of conflict, claims and disputes in construction.

Therefore, a client who perceives conflict, claims and disputes as a problem and wishes to lessen their incidence should proactively endeavor to:
a) limit or reduce contractual incompletedness, and/or
b) attenuate the opportunistic inclinations of the contractor.

Limit/Reduce Contractual Incompletedness

The singular most effective way of reducing contractual incompletedness is for the client and his staff/ consultants to comply with accepted construction industry "good practice" conventions. The Latham Report (Latham 1994) contains the most comprehensive "good practice" recommendations made in recent years. Whilst the report is directed at the UK construction industry, many of its findings are applicable to the construction industries of other countries.

Issues that are of particular relevance are:
- Adequacy of client organization and briefing process;
- Choice of the most appropriate procurement system (not necessarily the traditional approach, particularly if time is short),
- Selection of experienced, reputable and capable design consultants (particular attention should be paid to the design and coordination of building services);
- Contractor selection based on quality (including reputation and experience) as well as price.

Attenuation of Opportunism

Reputational factors

Some contractors value their "claims averse" reputations. Other considerations (that is, quality, price, and so on) being equal, such contractors are to be preferred. The term "claims averse" is used to describe contractors who value their reputations for restraint in the submission of opportunistic (that is, spurious or exaggerated) claims. In TCE terms, such contractors perceive their "claims averse" reputation to be of greater (long-term) value than the potential gain to be made from (short-term) opportunistic claims. However, as discussed earlier, a contractor who in normal circumstances may be claims averse can, at a stroke, move several notches up the opportunism scale when suddenly faced with the prospect of a substantial loss on a particular project.

There has been an abundance of literature in recent years on the subject of "partnering" (for example, NEDC Construction Industry Sector Group 1991, Uher 1994, Bennet and Jayes 1995, Godfrey 1996). Closely related topics are "relational contracting" (Alsagoff and McDermott 1994); and informal "clan relationships" which exist between consultants and contractors who frequently work together on the same projects, albeit that there is no contractual tie between them (Reve and Levitt, 1984).

Such "relational" factors and "partnering" arrangements, wherein the prospect of future work for a contractor is almost guaranteed (in other words, the current project is part of an ongoing series of projects - what Bennett and Jays refer to as "strategic" partnering), have the effect of attenuating opportunism. In TCE terms, the prospect of the future contracts is perceived by the contractor to have greater value than the potential gain of making an opportunistic claim on the current project. (Consequently, from a TCE perspective, the suggestion that similar benefits might accrue from a partnering arrangement for a single, one-off, project - that is, "project" partnering - is illogical).

It could be argued, from a sociological point of view, that any procedure which brings the parties together in the early stages of the project (for example, partnering and value engineering workshops) can have a positive influence on working relations and teamwork, which also may have the effect of attenuating opportunism.

Institutional factors

Williamson's (1985) analysis of commercial trust, which includes trust in the context of institutional environments (such as societal culture, trading networks, the professions and corporate culture), as a "check" on opportunism, has significant relevance in the construction field. As an illustration of societal culture Williamson refers to trading trust in Japan which "is said to be much higher than in Great Britain." This particular cultural characteristic may begin to explain not only why the incidence of claims and disputes is comparatively low in the Japanese construction industry but also why Japanese contractors working overseas are known to have "claims averse" reputations.

Alsagoff and McDermott (1994) in a study of relational contracting refer to the Japanese concept of "amae", meaning "cooperation and dependency", wherein clients, contractors and subcontractors maintain an ongoing relationship throughout a long series of projects. Any disputes, for example, over vaguely-worded contracts or the execution of additional work, are resolved by negotiation between the parties. An illustration is given, furthermore, of contractors taking the initiative to accelerate the project in the clients' interests, but at the contractors' expense, in the knowledge that the award of future contracts will reward this cooperation. "The overall result will be in a manner such that the short term losses incurred are compensated in the end".

An efficient and "well-informed" Client

According to TCE theory information impactedness or the deliberate withholding of information, to create a situation of differential knowledge/intelligence, is a form of opportunistic behaviour. It is advantageous for an opportunistic contractor to have superior knowledge than the client of the true facts.

Conversely, a client who is efficient and well-informed, has the effect of curbing an otherwise opportunistic contractor. A contractor will only spend time and money on the submission and pursuit of opportunistic claims and disputes if the contractor is of the view that his "chances of getting away with it" are good. A knowledgeable and well-informed client has the effect of reducing the contractor's "chances".

Alternative Dispute Resolution

The use of certain alternative dispute resolution (ADR) procedures, in particular those involving the appointment of an adjudicator (or similar) at the outset of a contract - in addition to their value in resolving disputes - can also have the effect of attenuating opportunistic behaviour by the parties. The presence within the project team of an experienced and well-informed, neutral third-party, whose sole objective is the successful outcome of the project (with minimal conflict/disputes) often has the effect of discouraging both parties from engaging in "one-upmanship" and spurious conduct.

The concept of ADR techniques assumes that the parties genuinely want their disputes resolved by alternative methods to arbitration. However, this assumption is not necessarily always valid. Sometimes an opportunistic contractor may decide there is little to be gained in resolving matters economically and efficiently. "In such circumstances realism might dictate the full majesty of the adversarial (arbitration) process in the hope of the return that a well briefed legal representative might deliver". (Clegg 1992).

Economic factors

The prevailing macro-economic climate has a direct influence on contractors' profit margins, and hence their inclinations to behave opportunistically.

"Virtually all who are engaged in the construction industry are profit-oriented. Invariably, this orientation stems not so much from inherent avariciousness but from the basic need for survival. Each firm must make a profit to survive, and all the individuals involved in the quest for profit are eager to prove their particular self-worth." (Hohns 1979).

A questionnaire-based investigation of UK contractors' tendering strategies during the construction industry recession in the mid-1990's demonstrated that the profit margins of five out of six leading contractors were less than one percent. (Pasquire and Collins 1996). The study also found that 65 percent of contractors would consider tendering at tight or even negative margins, during such difficult times.

In such circumstances it is hardly surprising that contractors are opportunistic. Indeed, Latham (1994) warns "when contracts are won on a price which can only produce loss for the main contractor, the likelihood of a contract dominated by claims is extremely high".

CONCLUSIONS

Given the "incomplete" nature of most construction projects, this study suggests that claims and disputes, to a greater or lesser degree, are inevitable.

The actual extent of claims and disputes, on a particular project, is largely governed by the client in determining the balance of his priorities - especially regarding time and cost - and through his selection of procurement system, client organisation, consultants and the contracting team.

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STRATEGIES FOR MANAGING LARGE SCALE BRICKWORK OPERATIONS IN A CHAOTIC ENVIRONMENT WITH REFERENCE TO COST

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ABSTRACT

This study examines practices adopted in the management of large-scale brickwork operations involving plastered brickwork, in a chaotic environment characterised by variations in brick, wall, and joint sizes. The case studies presented bring to light some of the major problems associated with such projects and strategies that have been adopted to cope with these problems during the tender and construction stages with special relevance to costs. The 'four-pronged' approach for managing brickwork operations though an improvement is very much a 'trial and error' approach when it comes to assessing the impact of brick size, joint size, wall width, and the like. As a remedy, a breakthrough approach is proposed to deal with such issues and to assess their impact on costs by the use of concepts such as 'cost density', 'cost homogeneity' and 'cost polarity' which are used for the identification of a set of 'decision rules' to facilitate decision making. An 'integrated approach' of both these methods are recommended as a way forward in managing large-scale brickwork operations in a chaotic environment characterised by variations in brick sizes, brickwork joints, and wall widths.

Keywords: chaos, brickwork, brickwork joints, chapparu, brickwork costs

THE CHAOS

Many international contractors carry out large volumes of work in developing countries. These countries are plagued with numerous problems due to non-standardisation, sub-standard materials and workmanship, country-specific practices and procedures and the like which makes it enormously difficult to manage construction. Additionally, certain procedures and practices are taken as the norms of these industries. As such, contractors should be able to find their way through such chaotic situations. To those in developed countries, these situations may appear chaotic. Often the approach to deal with such problems would be to impose standard solutions known to developed countries little realising that there are cheaper, equally better, and strategic approaches for dealing with such situations (Abeysekera and Thorpe, 1997b). This study deals with such a chaotic situation related to brickwork.

Brickwork in developing countries such as India, Sri Lanka, Pakistan and Bangladesh have many problems with variations in wall widths, brick and joint sizes, incorrect mortar mixes, unorthodox processes of laying bricks, and the like. Often these walls are plastered on both sides not as a means of concealing such apparent problems but due to social, cultural and other needs (Abeysekera, 1997; Abeysekera and Thorpe,1997b). Additionally, these walls carry light loads (Kodikara, 1996) often being used as partition walls. It is in this context that strategies contained in this paper are framed.

'Chaotic' brickwork

One would be surprised to know that many different countries specify varying format sizes for bricks meaning that there is no universally agreed set of format sizes (Abeysekera, 1997). This apparently lack of agreement manifests beyond simple imagination when one examines the variability in the sizes of bricks available in developing countries especially in Sri Lanka! (Bogahawatte, 1986) Sizes of bricks can be classed into broad groups with significant variations in sizes even within a group. One may therefore wonder how then a wall of a standard width may be built. Intriguing as it may be, brickwork joints play a part in solving this mystery.

Joints in brickwork play an important role with respect to strength, serviceability and cost. Additionally, joints serve as a 'buffer' for accommodating the dimensional inaccuracies of bricks. There are four types of joints in 'conventional' brickwork in English bond namely, the bed joint, the cross joints of the header and stretcher courses, and the wall joint in between two parallel stretcher bricks. In contrast, brickwork in countries such as Sri Lanka, India, and Bangladesh has a fifth joint, which is referred to as 'chapparu' in Sri Lanka. There are three of types of 'chapparu' joints as shown in Fig. 1. It is this joint that permits walls of a standard width to be built despite variations in brick sizes (Abeysekera and Thorpe, 1997a).

The procedure adopted in building a single brick thick 'chapparu wall' is to first fix the wall width (as required) by adjusting the bricks in the stretcher course (s/c). Thereafter, the bricks on the header course (h/c) are laid (with or without plumbing and stringing as appropriate) and the gap created by the shortfall in the length of brick (as compared with the wall width) is filled with mortar. (See h/c in Fig. 1.). Thus, it is possible to construct walls of varying widths by adjusting the size of the chapparu (with a corresponding adjustment of the size of the wall joint in the s/c). Similarly, a wall of a given width may be constructed not necessarily out of few discrete sizes of bricks and a standard joint size, but with a variety of bricks and joint sizes. In other words, 'chapparu' is an effective technology for coping with irregular brick sizes. Despite these variations in brick size, Abeysekera and Thorpe (1997a) has pointed out that wall of a standard width (or for that matter any given width) may be constructed not necessarily with a standard brick size with a standard joint size but with a wide variety of brick and joint sizes using the 'chapparu' technology which opens up new opportunities to minimise costs .

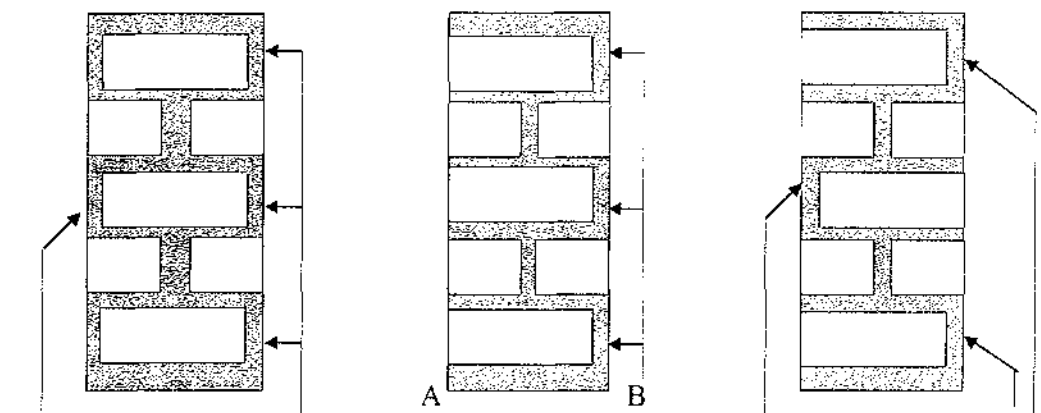

Fig. 1: Elevation of a single brick thick wall in English bond with 'Chapparu'

STUDY METHODOLOGY

Lin (1994) points out that the type of research question has a bearing on the research methodology. In particular, when 'how' or 'why' questions are being asked about a contemporary set of events over which a researcher has little or no control, the case study approach is considered to be useful (Lin, p.

9). For example, this research was interested in finding out 'how' industry coped with the current chaos. The fact that this method permits investigations in their real-life context was also seen as a benefit.

The study focussed on Sri Lanka and multiple sources were used for data collection, viz. interviews, direct observations and archival records. These were collected not only at the site level but also from their head offices by making several visits.

Whilst it was easy to identify projects where practices and procedures were generally similar, the unusual cases could only be identified through continuous investigation throughout the duration of the study. In order to identify the unusual cases a strategy adopted successfully was to examine practices and procedures adopted by contractors who had received awards for construction excellence (such as the award given the Institute of Construction Training and Development, Sri Lanka). This process was further facilitated by the researcher's involvement with institutions of higher learning as a result of coming in contact with professionals who were following courses in construction management. In addition, discussions with architects and their clients provided further information. Two cases are presented in this paper and related information is presented in a logical order with highlights at the end of each one. The validity of these case studies were ensured through a process of obtaining feedback on the written cases from those who were responsible for providing data.

CASE STUDIES

Two case studies are presented here. Both relate to large projects where brickwork accounts for a substantial volume of work. The first deals with a large multi-storey project whilst the second deals with a project involving the construction of a large number of single and two storey buildings in a large area of land. Whilst the first case throws light on the chaotic problems with a mediocre approach to dealing with these especially with regard to costs, the second shows how a strategic approach had been adopted to deal with the prevailing chaos.

CASE STUDY 1
Offices and Apartments at Rotunda Gardens
Linking Walls with Bricks

A new generation construction company handling both building and civil engineering projects is 'A' (Engineering) Ltd. It rose to fame in the construction boom of the early eighties. The company advertises with the catch phrase 'Concept to Reality. We are the Link'.

Ordering standard size bricks

A notable practice adopted at this company was to obtain its requirement of bricks by placing orders directly with kiln owners as standard size bricks were not freely available in the market - an attempt to 'link the width of a wall to the length of a brick'. One of its founder directors had this to say: "Ever since the Pugoda experience where for the first time we were compelled by our Chinese joint venture partner to get a brick manufactured to produce a standard size, I have got standard size bricks specially manufactured for projects handled by me. But now I don't have the time to do so and try to use available sizes. It's not easy to persuade the kiln owner to undertake special orders not because they are reluctant but because their employees resist change. These employees are usually paid on a piece-rate basis for moulding etc. and a larger brick means a reduction in their daily output unless the kiln owner is prepared to make adjustments accordingly. Often we make an advance payment and reserve the full firing which varies from about 30,000 to 50,000 bricks."

The supply of bricks to this 10-storey building was arranged centrally by its Supplies Division. The Chief Supplies Officer (CSO) was well aware of the principles of dimensional co-ordination of a brick. According to him, requisitions from sites never specified the size of bricks required; only the quantity and timing of the deliveries were specified. As such, the CSO specified a size of 8" x 3 3/4" x 21/4" (relating to a larger group of bricks available in the market) when quotations were called from suppliers who had to supply a sample as well.

Wall thickness and procurement of bricks

An examination of the BoQ showed that the specified wall width was 225 mm in 1:5 cement and sand mortar. In contrast, the Technical Specifications prescribed bricks to comply with the Sri Lanka standard for burnt clay bricks according to which the width should have been 220 mm. Thus there was a mismatch of the sizes. The senior engineer who was in overall charge when contacted at the initial stages of this project confirmed that they were making arrangements to obtain standard size bricks.

The practice that had been adopted was to select bricks related to larger sizes. Thereafter, the wall was made to the required size by adjusting the bricks in the stretcher courses whilst resorting to the use of 'chapparu' in the header courses. Therefore, there was no need to obtain a brick with the length matching the specified wall thickness. Subsequent investigations revealed that they had considerable difficulties in organising a delivery schedule of about 5,000 standard size bricks per day and as the Engineer (from the client's) was not rigid on enforcing the thickness of the wall specified, no attempt was really made to get standard size bricks. Instead they decided to use available sizes (i.e. bricks from the larger size groups) whilst maintaining the wall to a thickness of 8" (i.e. 203.2 mm). Despite this reduction, the client's quantity surveyor did not consider adjusting the rate for the reduction in wall thickness. However, the average size of bricks at this site was found to be 198 x 95.2 x 52.4 mm (7. 79"x 3.75" x 2.06"). This size, although matched breadth wise, was less in length and height. However, more often than not, suppliers were considered to be in a position to supply bricks matching the specified length and breadth but not the height.

In order to assess the need to match the wall thickness with column sizes, structural drawings were studied. Columns were 600 x 600 mm in the ground floor gradually reducing from floor to floor (with as many as 26 different sizes) to a minimum size of 300 x 300 mm. As almost all the beams were greater than or equal to 300 x 400 mm, and the columns were always greater than or equal to 300 mm, the necessity to match the wall thickness with either the column or beam size did not arise (at this site).

Wastage

Though flexible about the thickness of the wall, the Engineer took a serious view on the use of brickbats and prohibited their use completely. Heaps of broken bricks were seen to be lying on different floors. Although this appears to be a rational prohibition, studies have shown that the use of brickbats do not have a significant effect on strength (Chandrakeethi, 1987). After all, these walls carry light loads and are normally used as partition walls.

Transportation of bricks

The vertical transportation of bricks was by a material hoist using wheelbarrows. These wheelbarrows of half moon shape were of a special design with the centre of gravity of the loaded barrow being over its axle and could carry a larger volume. Trade sub-contractors had to transport all the materials themselves as against the use of separate subcontractors to transport bricks. The Project Manager explained the reasons for this decision as follows: "We have found that when we use a separate sub-contractor to transport bricks, the trade sub-contractors avoid using broken bricks for convenience. This leads to more wastage. So, we have now decided to get them to pull the bricks as they will think

twice to reject a brick which they have already transported." This argument makes sense but would not be of any advantage at this site, as half-bricks were prohibited.

Control of wall thickness

Due to the problems of varying sizes of bricks from one delivery to another, the company has a practice of marking the thickness of the wall on the floor with another set of lines to mark the boundaries of the wall plaster as well exercising thereby control not only over the wall thickness but on the thickness of the wall plaster as well.

Controlling joint sizes

Asked how, they control the joint thickness, the Project Manager narrated the experience of the company with the use a 'gauge rods'. Originally, a bed mortar thickness of 1/2" (and not 10 mm) was adopted for marking course heights. Early experiences revealed that they found it difficult to obtain a 'neat finish' due to the irregularities in the floor levels. In order to get over this problem, a reference level was marked on columns from which the course heights were set out on the column faces. The bed mortar of the lower most course took up any undulations in the floor. As the subcontractors got accustomed to this practice it was withdrawn.

Despite this experience, no gauge rods were used at this site. The average bed mortar thickness was computed to be 23.2 mm - much greater than the standard size of 10 mm. The reasons for this was obvious as none of the practices mentioned above were implemented at this site at the time of this study.

Preparation of Mortar

Mortar was prepared by volume batching using pans for measuring sand instead of gauge boxes. As a result a mix stronger than 1:5 was used. Additionally, no attempt was made to adjust for bulking of sand. Abeysekera (1987, 1997) has pointed out that a cement sand mix of 1:5 could turn out to be 1: 2 1/2 when using bulked fine sand thereby completely eroding any profit from such work.

Table 1: Case highlights

Feature	Assessment
Procurement of bricks	CSO specifies 8" x 3 ¾" x 2 ¼" when the size required is 220 x 105 x 65 mm. Site requisitions do not specify size.
Wastage	High wastage as the Engineer prohibited the use of broken bricks. Research indicates potential for use.
Transportation to higher floors	Trade subs made to pull bricks and sand as well to ensure they use half bricks. Not of strategic importance to this site. Ergonomically designed wheelbarrow with larger volume.
Wall width	Maintained at 8" (203.2mm). Reduced from 220mm. Valuations disregard reduced width. Wall width marked on floor. No necessity to match columns/beams due to larger structural sizes.
Joint size/ Course height	Large bed joints; uncontrolled. Previous experience of experimentation with the use of gauge rods and marking course heights on columns not practiced.
Preparation of mortar	Inaccurate mixing. Hand mixed using pans. No allowance for bulking. Use of stronger mixes than specified.
Cost control	No check on overall cost. Labour cost controlled by the use of subcontractors. No significant attempt to control material costs. No material reconciliation statements either.

CASE STUDY 2:
Factory and Residential Complex
The Strategist

'B' Engineering is a Grade 1 construction contractor. The project was secured on competitive tender and was located in the suburbs of Colombo, the capital city of Sri Lanka. It involved the construction of a factory building, a residential complex with eleven single storey houses and a two-storey administration cum canteen block within a short period of 6 months. Whilst cement blocks were used for the factory, burnt clay bricks were used for all other buildings.

The Project Manager emphasised to the researcher the importance of managing brickwork activities efficiently due to the large volume of brickwork involved; a loss in this activity would mean a substantial erosion of profits.

The architects insisted that walls must be built to a thickness of 9" as specified and matched with 9"x 9" columns in the administration block. The initial consignment of bricks purchased from Kochchikade (source of supply of smallest group of bricks) led to many problems. As bricks were smaller (around 7.75" length), excessive amount of mortar had to be used to make walls to 9". Attempts to reduce the price of bricks by suggesting a closer rout to the site from sources of supply proved futile.

Turning to other sources of supply proved cost effective. The project was located in close proximity to another principal brick manufacturing area (i.e. Kaduwela - Hanwella) where the bricks were comparatively larger and more expensive. Concerned about the high price of these bricks, an exercise was undertaken to find out the price that could be paid for larger bricks (from Hanwella area) when compared with the smaller bricks from the Kochchikade area (i.e. Strategy No. 1): The procedure adopted was to calculate the material cost of a cube of brickwork assuming an average joint size of 1/2" using a smaller brick size of 7 3/4" x 3 3/4"x 2". A mortar mix of 1:5 was adopted as specified. Similarly, the cost of a cube of brickwork for a Hanwella brick of 8"x 4" x 21/4" was calculated by assuming the price of the brick as the variable.

Note: Re-calculated as original data were not available

The area of wall for one cube of brickwork = 100/.75 = 1.3333 squares

Calculating the cost of mortar ...(1US$ = Rs. 60/- approx., 1997)

When preparing mortar for masonry work, a bag of cement weighing 50 kg. is to be taken as 0.035 cu. m. (Specifications for Building Works, ICTAD Publication No. SCA/4, Vol 1, p33). For a mix of 1: 5, the volume of sand = 5 x 0.035=0.175 cu. m.= 6.18 cu.ft.

To prepare one volume of mortar using a mix of 1:5 it is necessary to use 1.25 volume of sand. Hence, with 6.18 cu. ft. of sand, the volume of mortar that can be prepared would be 4.94 cu. ft.. Hence, the cost of 4.94 cu. ft. of mortar would be as follows:

Cost of cement @ Rs. 220/- a 50 kg. bag	=	Rs. 220.00
Cost of 6.18 cu. ft. of sand @ Rs. 1000/- a cube	=	Rs. 61.80
Total	=	Rs. 281.60
Therefore, 1 cube of mortar= (281.60/4.94)x100	=	Rs.5704.45

Calculating the cost of one cube of brickwork-Kochchikade bricks 7 3/4"x33/4"x 2"...

Price of 1000 bricks	= Rs. 1500/-
No. of bricks per square=2x100x12x12/[(7.75+.5)x(2+.5)]	= 1396.36
Therefore, the no. of bricks per cube	= 1.3333 x 1396.36
	= 1861.77 bricks.
Therefore, the volume of mortar per cube of brickwork	= 100 - Volume of bricks
	= 0.3738 cubes
Cost of one cube of brickwork with an allowance of 5% as wastage	=1.5x1862x1.05+0.3738 x5704.45

Calculating the cost of one cube of brickwork using Hanwella bricks 8"x 4" x 21/4" ...

Let, the price of a Hanwella brick be 'P'.	
No. of bricks per square	= 2 x100 x12 x 12/[(8+.5)x(2.25+.5)]
	= 1232.09
Therefore, the no. of bricks per cube	= 1.3333 x 1232.09
	= 1642.74 bricks
Therefore, the volume of mortar per cube of brickwork	= 100 - Vol. of bricks
	= 0.3155 cubes
Cost of one cube of brickwork with an allowance of 5% as wastage	= P x 1232 x 1.05 + 0.3155 x 5704.45

Calculating the price which can be paid for the Hanwella bricks ...

P x 1232 x 1.05 + 0.3155 x 5704.45	=	1.5 x 1862 x 1.05 + 0.3738 x 5704.45
Therefore, P	=	Rs. 1.89 (i.e. Rs. 1890 per 1000)

As the going rate for bricks from the Hanwella area at this time was Rs. 1650/- per thousand, the use of the larger brick appeared to be cheaper. This method highlights a procedure that could be adopted in coping with different sizes of bricks from different areas by computing a 'competitive price' for a brick from another locality. Although there are some shortcomings in these calculations the basic method could be improved to provide a better comparison.

Having selected to use a brick from the larger group of bricks, a strategy had to be developed to cope with the problem of different sizes within a 'size-group'. Suppliers were invited to quote with samples. Their prices were evaluated to identify the lowest price per unit of volume of brick. It was then used for multiplying the volumes of other sample bricks provided by other suppliers to arrive at a price for each and every short-listed supplier. (i.e. Strategy No. 2). After further negotiations, suppliers were selected to supply a specific size at a corresponding price. Thus, it was not a question of selecting one supplier but many with different prices for the brick they were prepared to supply. There was no guarantee however that they would supply bricks conforming to the approved sample. The strategy adopted to overcome this problem was to measure the average size of the brick delivered and fix a price based on volume using the unit volume price established during tender (i.e. Strategy No. 3).

Having accepted the premise that different suppliers will supply different sizes of bricks in order to meet the daily demand, yet another strategy had to be developed to avoid unloading bricks of different heights at the same locality. This was necessary to overcome problems of bonding bricks with different heights in the same course. Thus when the bricks came in, having fixed the price (when in variance with the approved sample) the load was directed to a specific building depending on the height of the bricks in use at a particular location (i.e. Strategy No. 4). The availability of adequate space facilitated stockpiling of materials, which was useful in overcoming price hikes, and the poor quality of bricks produced during monsoonal periods. The same practice was adopted for sand as well.

As the 9" wall thickness could accommodate the brick size delivered to site (wall thickness > 2B+ 1/2" and L), the variation in the length or the breadth of the brick did not pose any problems when laying bricks in English bond. The procedure was to lay stretcher courses to the required wall thickness and the header courses with the 'chapparu' though there were no attempts made to control joint sizes.

Table 4.2: Case highlights

Feature	Assessment
Procurement of bricks	Selection of a broad 'size group' by fixing a 'competitive price' for another group and for comparing it with market prices. Prices fixed on delivery using unit volume price agreed at tender.
Wastage	High wastage as the Engineer prohibited the use of broken bricks. Nevertheless, research related to strength of brickwork indicates potential for use of brickbats.
Transportation	Points of unloading of deliveries controlled by height of supplied bricks.
Wall width	Maintained at 9" to match with column sizes.
Joint size/ Course height	No evidence of control. Assumptions of a ½" joint found to be incorrect as the joints sizes were very much greater at site.
Preparation of mortar	Inaccurate mixing. Hand mixed using pans. No allowance for bulking. Use of stronger mixes than specified.
Cost control	Material costs controlled by the use of strategies 1 to 4. Additionally, bricks and sand stockpiled due to availability of space thus mitigating impacts due to bulking, poor quality of bricks and price hikes during monsoonal periods.

STRATEGIES

The strategies discussed herein deal with what has been labelled as 'chaotic brickwork' where walls are plastered on both sides, carry light loads, and are used often as partition walls. In the introductory paragraphs of sections 1.0, it was implied that imposing standard solutions known to the developed world would be extremely difficult, if not impossible when dealing with such chaotic situations. The case studies presented herein provided sufficient evidence to reinforce this viewpoint.

One of the characteristics of large-scale brickwork is the high rate of utilisation of bricks; for example, rates of 5000 bricks per day are not uncommon. This demand could be concentrated, scattered or both as demonstrated by the two case studies. Depending on availability of space, supplies can be arranged on a just-in-time basis, or stockpiled (on or off site) strategically (for example to deal with price increases caused by inclement weather etc.). In particular, Abeysekera (1987) has provided advice on how to deal with similar issues with regard to costs. Additionally Gilbreth (1974), has dealt with various other issues related to bricklaying and systems for bricklaying. However, the intention of this paper is to recommend strategies, which has a special relevance to the chaotic type of brickwork referred to before: What strategies should be adopted in managing brickwork when it is extremely difficult (or almost impossible) to purchase standard size bricks with significant variations in available sizes? Should an international contractor import bricks or use available bricks? Which size of brick should be used? Should the joints be taken as 1/2" or 10 mm? Or, should they be some other size to optimise cost? Should joint sizes be controlled or left uncontrolled? Does it matter? What are the implications on such decisions on costs especially when using weak mortars? These are but some questions that need to be addressed when deciding on strategies to manage large-scale brickwork operations under chaotic conditions as described in this paper. Indeed, large-scale brickwork impose demands not only on material resources but also on labour and plant. As such, strategies discussed below are not exhaustive. Nevertheless, they address strategies that could be adopted to deal with some of the major issues.

Tender Stage

It is prudent to clarify during the tender stage most of the issues that lead to chaos although not totally necessarily as it can be part of a contractor's strategy not to do so. For example, issues related to, size of brick (when standard size bricks are unavailable in the market), whether width of wall can be reduced to suit available brick sizes (in situations where column and beam sizes do not have to be matched with), whether the size of the joint has to be maintained at 10mm, and whether broken bricks (i.e. half bats) could be used (in the header course) and so on. If clarified before tender, it would be easier to reach a price for brickwork. Clearly, such an approach would minimise risk. However, as mentioned earlier, a contractor may opt to take a high-risk approach (without seeking any clarification) and profit by doing so! Of course, in situations where the contractor is the developer, there are many approaches for reducing costs, as for example by reducing the wall thickness to suit available brick sizes without comprising on issues related to structural stability, serviceability, durability and the like as explained later.

Construction Stage

Procurement of bricks

One of the fundamentals questions that arise is with respect to the size of the brick to be selected in order to minimise costs and is dealt later in section 5.7. Clearly the length of the brick selected should be less than the specified width of wall due to number of reasons. This may appear strange: In countries where bricks are predominantly hand made, the dimensional tolerances imposed by national Standards have to be relaxed (Abeysekera, 1990) implying that walls may have to be built with 'chapparu' to cope with the dimensional inaccuracies. However, if the contractor opts to use machine made bricks, the contractor may have to resort either to stockpiling with a long lead-time or import standard size bricks. Both these options appears to be time consuming and costly. The other option is to place orders directly with kiln owners to get the desired size of brick. However, this is neither easy nor satisfactory due to socio-cultural and technological issues (Abeysekera, 1997; Bogahawatte, 1987).

Therefore, it is imperative that with high rates of demand for bricks, sites will receive a considerable mix of different sizes of bricks as suppliers will increasingly find it difficult to meet demand. Whilst inaccuracies in the length and width of a brick could be accommodated by chapparu and other joints, variations in brick height would not be as easy. It would be prudent to channel deliveries to suitable localities based on brick size parameters in such situations as explained in the second case study. In construction of multi-storey buildings this would mean that bricks of different heights might have to be channelled to different floors or to different localities within a floor; a carefree attitude would be costly chaotic.

Wall width

When walls have to be built to a particular width (as against a permissible variation in width), the practice of setting-out the wall width on the floor is highly recommended. When doing so, it would be prudent to investigate the match (or the mismatch) with the size of the beam soffit or column face. If not taken care of, the contractor may incur extra expenditure to the extent that there may not be any profit left in brickwork or plasterwork.

Wastage of bricks

In the event brick bats are permitted to be used (research indicates insignificant effect on strength when used in the header course as explained earlier), care must be taken to ensure that trade subcontractors use brickbats as there is a tendency to avoid using these. In such situations, the better

choice would be to use trade subcontractors to transport bricks instead of a separate set of subcontractors for reasons explained earlier.

Transportation of bricks

In situations where separate subcontractors are used for transporting bricks to upper floors (in multi-storey construction), they can be used overnight to increase the utilisation of say a hoist or a crane but care needs to be taken to ensure that different sizes of bricks are not mixed up, firstly with respect to the brick height and then with respect to other dimensions. Care must also be taken to ensure that number of bricks transported say to a floor does not increase the total number required.

Joint sizes

Of all the joints in brickwork, the bed joint takes centre place for two reasons; firstly, it contains the largest proportion of mortar in all joints (Abeysekera, 1997); and secondly, it's size can be changed irrespective of the size of brick. In the event the size of the bed joint needs to be regulated then it would be possible to use one of the conventional approaches of using a gauge rod with course heights marked; a number of different rods may be required to cater for different brick heights. A better approach would be to mark the course heights on a column face (if possible) to overcome irregularities in the floor. As to the question on which size of bed joint to be used, one needs to focus on the tender stage discussions. If not, a cost effective size can be selected as explained in section 5.7 when using trade subcontractors.

Preparation of mortar

Lack of care in proportioning mortar can have a significant impact on costs especially when stronger mixes are used. The impact can be disastrous when using fine sand without adjusting for bulking. Clearly, there is a need to 'get back to basics'.

Control of costs vis-a-vis cost densities and cost polarities

Almost all the items mentioned above are, one way or the other, related to cost and some strategies have already been discussed with regard to these items. Subcontracting, which is of common practice today, is indeed an effective strategy for controlling labour costs. As for material costs, strategies are not as simple and are discussed herein with respect to size of bricks, their purchase prices, and the sizes of joints to be used.

In situations where the size of the bed joint is taken as fixed, the four management strategies discussed in the second case would be an excellent approach to follow provided assumptions made therein remain unchanged during construction. The whole process could be computerised thereby making it simpler to establish what was referred to as the 'competitive price'; the sole criterion used for deciding on the cheapest brick-size-group to be selected.

Does the bed joint size matter? Which joint size should be used to optimise costs? Will it vary with different mix proportions? Does the wall width matter? How does the brick size affect this choice? An easy way to answer such questions would be to use a trial and error procedure. Clearly, this is not very efficient; the method discussed below would be better.

The total material cost of brickwork is made up of the cost of bricks and mortar. Therefore, to minimise the total cost of material it is only necessary to examine which of the two is cheaper. In other words, what has to be done is to compare the 'cost density' (i.e. cost per unit volume) of brick against mortar. If both are the same, then there is 'cost homogeneity' which means that the total material cost would not vary on the joint size or the brick size selected! However, if they are different, one may want to ascertain when the difference matter with respect to the selection of brick and joint sizes. To

respond to this question it is necessary to compute what has been labelled as 'cost polarity' which is the cost density of bricks to cost density of mortar. It has been shown that if the 'cost polarity' is outside the range 0.75 - 1.40, savings greater than 5% can be achieved by manipulating the brick to mortar ration from 5.0 to 2.0 or from 2.0 to 5.0, appropriately (Abeysekera and Thorpe, 1997c). Hence, the strategy to deal with issues related to costs would be to adopt an 'integrated approach' combing both the four-strategy approach and the cost polarity approach; indeed a breakthrough approach for finding the way through this apparently chaotic situation.

CONCLUSIONS

When there is apparently uncontrollable variations in sizes of bricks, brickwork joints, wall widths coupled with variations in prices of material, labour, plant, and country specific practices and procedures, managing large scale brickwork operations appear to be a nightmare only if the contractor does not know how to find its way through this apparently chaotic situation.

With ramifications both to the tender stage and the construction stage, strategies presented herein make it simpler to deal with such chaos. In particular, the four-pronged strategy provides a broad approach to managing the overall aspects of large-scale brickwork. The approach via the concepts of 'cost density', 'cost polarity' and 'cost homogeneity' untangles the web of complexities down to a simple set of 'decision rules' with respect to cost related decision-making. Other strategies of a minor nature assist in dealing with the totality of the situation. These strategies, when applied, solve the mysteries of chaotic brickwork.

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A MODEL OF CONTRACT RISK IN CONSTRUCTION FIRMS

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ABSTRACT

The bidding decision includes the estimation of optimum mark-up, which represents major decision problems for contractors to formulate successful business strategies. However, most of construction contractors deal with risk analysis with rules of thumb. In addition, many risk factors are difficult to be measured or quantified with conventional mathematics. This paper describes the application of fuzzy reasoning technique to model contract risk analysis. The use of the model is illustrated by a case study. A model of contract risk decision for construction project is developed.

Keywords: Contract risk, fuzzy reasoning, decision-making

INTRODUCTION

Construction is a very competitive high-risk industry governed strongly by economic, political, legal, social and environmental issues. A construction project involves a large number of people with different technical skills and interests coordinating a wide range of activities. Shen (1997) pointed out that such complexity is further compounded by the unique features of a project and many other external uncertainties. It is common to find construction projects with cost overrun, time delay and poor quality caused by various risks. In practice, some risks which are considered as a qualitative factors rather than quantitative factors. Contractors always tender the job without considering the extent of risks allocating in the contract and others crucial qualitative factor, i.e., risks inherent in the nature of project; the project team identity; and conditions of contract.

Risk analysis largely based on contractor's experiences, common sense, knowledge and instinct. Hence, textbooks generally provide a comprehensive process, rather than analytical techniques, in dealing with risk analysis. Lam et al., (1998) found that there are no solutions using linear programming methods because the actual problems of people cannot always be modeled using the rigid constraints of linear programming. They also pointed out the qualitative attributes are not easy to measure or quantify with conventional mathematics. Therefore, the transformation of qualitative attributes into a quantitative representation is essential. The main objective of this study is to investigate and develop a model of contract risk assessment for construction firms.

FUZZY REASONING

The concept of fuzzy reasoning used in this study is based upon the application of fuzzy logic to control theory (Zimmermann, 1991). Its objectives are to model human experience and human decision-making behavior. The associated inference engine has multiple input signals (i.e. the elements) and one output signal. The output signal may be a decision, judgement or prediction from a question. Suppose there are N elements to be considered, each being characterized by e_i where $i \in [1, 2, ..., N]$,

the output being characterized by *0*. Each element, including the output, is assumed to have *M* levels of consideration C_j, subject to $j \in [1, 2, ..., M]$. For example, a certain e denotes, say "Labor supply". This variable will have a certain number of linguistic descriptions. The labor supply may be adequate or there may be a shortage in the supply of labor. Each linguistic description is in fact a level of consideration, C_j. Each level of consideration is itself a fuzzy subset with an appropriately defined membership function. The membership function is a function that converts linguistic terms into a sense of belonging, or more specifically, a degree of membership, of an element within a fuzzy subset. The returned value is a real number in the range *[0, ..., 1]*. The value "1" indicates strict membership while "0" indicates that a certain element has no relation to the subset. Partial belonging is represented by a value between 0 and 1. For example, "Adequate" is a fuzzy subset of "Labour Supply". A membership function represents the level of truth in stating that the real supply of labour in society belongs to the group "Adequate". Conventionally, a triangular membership function is used, e.g., the membership of "Labour supply" in the subsets "Adequate" is termed "1" when the unemployment rate of the whole society is below 2% and termed "0" when the unemployment rate is beyond 10%. The membership value will decrease from 2% to 10%. Any actual data can be successively mapped to a suitable membership value for each fuzzy subset by an appropriate membership function.

The procedure for converting linguistic concepts into membership values is known as fuzzification. After fuzzification, the data is passed into the inference engine containing a rule base. The rule base actually consists of linguistic rules and their general format is shown below:

First rule: If e_1 is C_1 and e_2 is C_1 and .... and e_N is C_1 then *0* is C_k; $k \in [1, ..., M]$

: : : : : :

Pth rule: If e_1 is C_{p1} and e_2 is C_{p2} and .... and e_N is C_{pN} then *0* is C_{op}; where *(P1, P2, ... PN, OP)* $\in [1, ..., M]$

: : : : : :

Last rule: If e_1 is C_M and e_2 is C_M and .... and e_N is C_M then *0* is C_1; $1 \in [1, ..., M]$

Theoretically, N^M rules are deemed necessary to cover the whole picture. However, the advantage of fuzzy reasoning is that even when all the rules are not present, we can still get reasonable and useable results. The larger the rule base, the better the results will be. When a case *(x)* is evaluated, it is put into each rule in turn by the popular max-min operation, i.e.

$$\mu(o \text{ is } C_{op}) = \min_{k=1}^{N}[\mu(e_i \text{ is } C_{pi}] \tag{1}$$

e.g. min [0.4, 0.5, 0.7, 0.2] = 0.2

For the *Pth* rule,

$$\mu_{[o \text{ is } C_{op}]}(x) = \min_{k=1}^{N} \mu_{[e_k \text{ is } C_{pk}]}(x) \tag{2}$$

and the final results are given by the centre-of-gravity method:

$$\text{Results} = \frac{\sum_{P=1}^{T} Val(C_{op}) * \mu_{[o \text{ is } C_{op}]}(x)}{\sum_{p=1}^{T} \mu_{[o \text{ is } C_{op}]}(x)} \tag{3}$$

MODELLING OF CONTRACT RISK

The contractors' experience and subjective judgement in dealing with the variables whose values are qualitative in nature. In the process of transform a qualitative attribute into a quantitative representation, Zadeh (1975) advocated the use of fuzzy sets with fuzzy membership functions. The membership function is a real number in the range of zero to one. The popular functions for fuzzification are either the s functions or (function; in fact, this is a combination of two S functions. Figures 1 depicted the s and (functions.

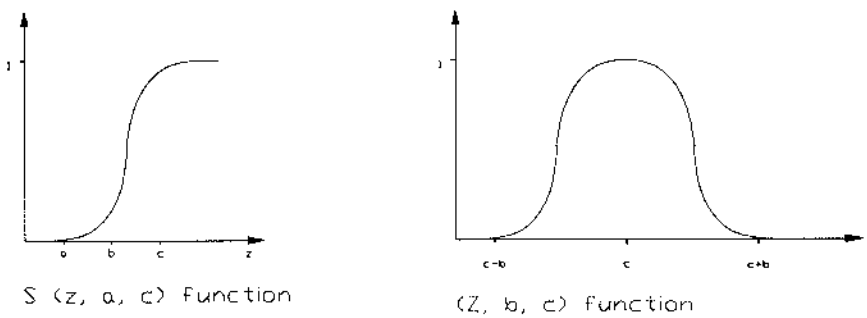

Figure 1 Definition of S and π Fuzzification Functions

Input Variables and Terms

Professionals and experts in the construction firms were invited to provide information to enable decision-making criteria to be determined. One of the most important variables in contract risk analysis is mark-up size. However, such information is rather sensitive. Informal discussions with potential participants indicated that not many companies were willing to participate. In this respect, only fifteen experts with different professional knowledge and experience participate in this study. Ten out of fifteen experts were elected to provide different viewpoints in formulating the model. The participants include managing director and director of construction company, associates and project quantity surveyor of consulting firm and client's project manager.

With their professional knowledge and experience, twelve input variables are identified as crucial factors influencing a contractor's decision in the mark up of the contract. The twelve input variables are divided into three categories, and classified as qualitative factors, could not measurable by conventional mathematical techniques. The details of the input variables are listed in Table 1.

Table 1 Qualitative Factors

IV_1	:	**Scale of the project**
TIV_{11}	:	very small, contract sum, below HK$8,000,000.00 ~ HK$35,000,000.00
TIV_{12}	:	small, contract sum HK$20,000,000.00 ~ HK$50,000,000.00
TIV_{13}	:	quite small, contract sum HK$35,000,000.00 ~ HK$100,000,000.00
TIV_{14}	:	medium, contract sum HK$80,000,000.00 ~ HK$300,000,000.00
TIV_{15}	:	quite large, contract sum HK$200,000,000.00 ~HK$600,000,000.00
TIV_{16}	:	large, contract sum HK$500,000,000.00 ~ HK$900,000,000.00
TIV_{17}	:	very large, contract sum HK$750,000,000.00 ~ about HK$1,500,000,000.00
IV_{21}	:	**Complexity of the project**
TIV_{21}	:	very simple, traditional method for low-raise factory building.
TIV_{22}	:	simple, traditional method for low-raise residential building.
TIV_{23}	:	quite simple, traditional method for high-raise factory building.
TIV_{24}	:	normal, traditional method for high-raise estate development.
TIV_{25}	:	quite complex, traditional method for complex and commercial building.
TIV_{26}	:	complex, innovative method for complex and commercial building.
TIV_{27}	:	very complex, innovative method for intelligent building.

IV_{3J} : Experience in such project
TIV_{31} : plenty of, with 13-more than 18 times' experience in sort of project
TIV_{32} : a great deal of, with 10-15 times' experience in sort of project
TIV_{33} : a lot of, with 8-12 times' experience in sort of project
TIV_{34} : several, with 3-9 times' experience in sort of project
TIV_{35} : some, with 2-6 times' experience in sort of project
TIV_{36} : a few, with 1-4 times' experience in sort of project.
TIV_{37} : none, without any experience in sort of project.

IV_{4K} : Degree of hazard (safety)
TIV_{41} : very low, without excavation work and the project sited on open area
TIV_{42} : low, without excavation work and the project sited on close area
TIV_{43} : quit low, without deep excavation and the project sited on open area
TIV_{44} : normal, without deep excavation and the project sited on close area
TIV_{45} : quit high, with deep excavation and the project sited on close area
TIV_{46} : high, with deep excavation and the project sited on close area
TIV_{47} : very high, with deep basement and the project sited on close area

IV_{5L} : Client identity
TIV_{51} : vexatious, not easy to approach and as a troublemaker
TIV_{52} : reasonable, with good sense and power to think, understand and form opinions
TIV_{53} : pleasing, friendly even to strangers

IV_{6M} : Architect identity
TIV_{61} : vexatious, not easy to approach and as a troublemaker
TIV_{62} : reasonable, with good sense and power to think, understand and form opinions
TIV_{63} : pleasing, friendly even to strangers

IV_{7N} : Nominated sub-contractor identity
TIV_{71} : uncooperative, claim orientated and as a troublemaker
TIV_{72} : fairly cooperative, with good sense and power to think, understand and form opinions
TIV_{73} : vary cooperative, partnering and as a troubleshooter

IV_{8P} : Time Constraint
TIV_{81} : very tight, 55-below 40% of normal time span
TIV_{82} : tight, 85-45% of normal time span
TIV_{83} : normal, 75-120% of normal time span
TIV_{84} : slack, 110-130% of normal time spans
TIV_{85} : very slack, 120-over150% of normal time span

TIV_{9Q} : Extension of time clauses (such as inclement weather, civil commotion, availability of labor and material, delay on the part of NSC or others engaged by the employer)
TIV_{91} : totally transfer all responsibility for any delay caused by the above to contractor
TIV_{92} : partially transfer the responsibility for any delay caused by the above to the contractor whatever the risks are not be controlled or managed by the contractor.
TIV_{93} : allocating and sharing all responsibility for any delay to the appropriate parties who are competent and qualified to manage them.
TIV_{94} : partially take up the responsibility by the client for any delay caused by the above whatever the risks are to be controlled or managed by the contractor.
TIV_{95} : totally take up all responsibility by the client for any delay caused by the above.

IV_{10R} : Amount of liquidated and ascertained damages
TIV_{101} : very high, amount of L. D. above $400,000.00 ~ $200,000.00
TIV_{102} : high, amount of L. D. $100,000.00 ~ $300,000.00
TIV_{103} : normal, amount of L. D. $100,000.00 ~ $200,000.00
TIV_{104} : low, amount of L. D. $50,000.00 ~ $120,000.00
TIV_{105} : very low, amount of L. D. below $10,000.00 ~ $80,000.00

IV11S	:	**Time limitation for submission of claims for loss and expense**
TIV111	:	very tight, Claims should be submitted within less than 7 ~ 14 days
TIV112	:	tight, Claims should be submitted within 10 ~ 28 days
TIV113	:	slack, Claims should be submitted within 21 ~ 45 days
TIV114	:	very slack, Claims should be submitted within 30 ~ 60 days
TIV115	:	none
IV12T	:	**Payment terms**
TIV121	:	amended payment terms are not in contractor favour
TIV122	:	without any amendment has been adopted in the printed form of contract.
TIV123	:	amended payment terms are in contractor favour

Fuzzification of the Ingredients

Twelve input variables have been identified by the experts. The input variables are transformed into a fuzzy membership function. s functions and π functions are adopted to represent the membership functions. And one of the examples of the input variables is transformed into a fuzzy membership as shown in Figure 2.

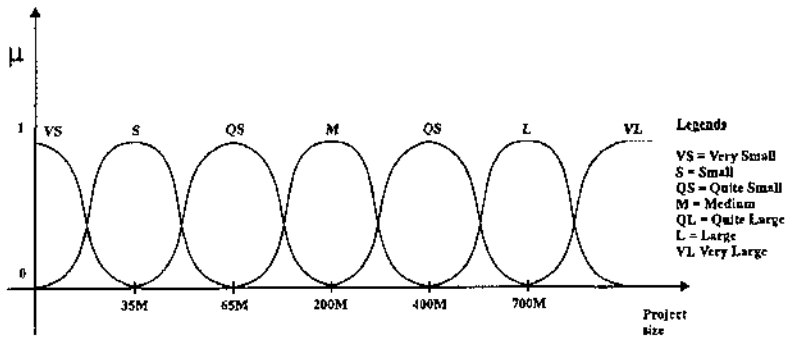

Figure 2 Fuzzification functions for "project size".

The base rule is then built-up based on the past experience and knowledge of the experts. The typical format of one rule is shown on as follows:

$$\text{If } \{ I V_i \text{ is } T I V_{ik} \} \text{ and .....and } \{ I V_u \text{ is } T I V_{uv} \} \text{ then } O V_j$$

$$\text{Where} \begin{cases} i \in \{1, \ldots\ldots\ldots\ldots, N\} \\ k \in \{1, \ldots\ldots\ldots\ldots, S_i\} \\ u \in \{1, \ldots\ldots\ldots\ldots, N\} \quad \text{and } U \neq 1 \\ V \in \{1, \ldots\ldots\ldots\ldots, S_u\} \\ j \in \{1, \ldots\ldots\ldots\ldots, M\} \end{cases}$$

(Source : WONG and SO (1995))

For example
The first base rule and membership functions are developed as follows:
If the size of project is very large
And the complexity of project is very high
And the contractor has none of experience in this type of project
And the Degree of hazard is very high
Then the risk is extremely high.
If $\mu_{sp}(VL) = 1$, $\mu_{cp}(VH) = 1$, $\mu_{ce}(N) = 1$ and $\mu_{dh}(VH) = 1$

Applying equation, the max - mix operation, the membership function of risk level in related to "project nature" for the first rule is
μ_{risk}(Extremely high) = min [$\mu_{sp}(VL)$, $\mu_{cp}(VH)$, $\mu_{ce}(N)$ and $\mu_{dh}(VH)$]
Then μ_{risk}(Extremely high) = 1

Similarly, the base rules, for assessment of the risk level of each category of variable are formulated.

Each of the membership functions is then fed into the inference engine where standard operations in fuzzy mathematics are carrying out, resulting in membership functions belonging to the output variables. In order to give a clear indication to the human user, the membership functions are defuzzified back into output variables that are understandable.

In the contract decision model, the output is formed to enable the management in viewing the risk level of the project inherent in the contract. Such risks are generated from the contract that is classified as linguistic variable.

Twelve variables have been transformed into membership functions belonging to the corresponding fuzzy subsets. The output represents the risk level for the project. The values of the risk factors are assumed and fuzzified as follows:

"Extremely high" is 7
"Very high" is 6
"High" is 5
"Medium" is 4
"Low" is 3
"Very low" is 2
"Extremely low" is 1

The membership function of the risk level for each category is show in Figure 3.

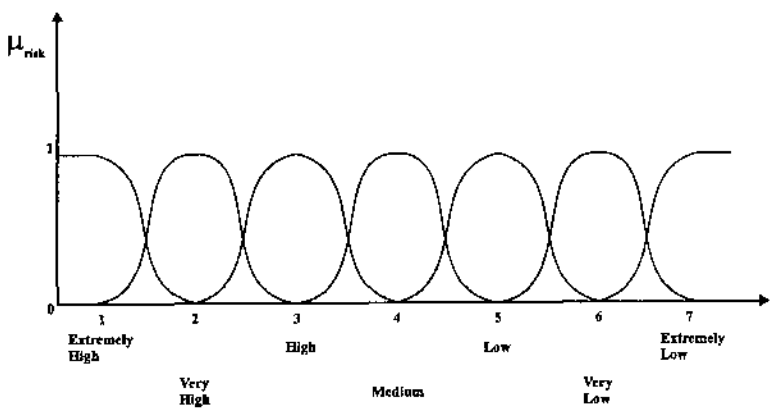

Figure 3 Membership Functions for Contract Risk

The center-of-gravity method is used to determine the overall risk level in connection with three categories of project nature, project team identity and conditions of contract.

CASE STUDY

A real case is employed to demonstrate the procedures on assessment of contract risk as designed. A large-sized building contracting firms bided the project in early 1996. The project was a commercial building construction that was located at Kowloon, Hong Kong. The client was one of the large private developers in Hong Kong. Their main businesses were property development, management and speculation. The client appointed a famous architect firm for the design associated statutory procedure. Furthermore, the client also established a project team, within their organization, to monitor the whole development. Numerous nominated sub-contractors have been appointed. These include electrical work; fire services; curtain wall system; lift; plumbing and drainage; and interior decoration work. The total of prime cost sums for the nominated sub-contractors amounted to $300 million.

The project comprised of three-office towers resting on a two-story podium with a transport interchange area and three level basement car-parks underneath. Separate contractors had completed the foundation and steel sheet piling. The duration of project for superstructure and basement construction was 600 calendar days. The project commenced on August 1996 and should be completed on April 1998. The project sited next to a group of old low-raised building. The conditions of that group of buildings were very poor.

The client adopted the Standard Form of Contract Private Edition - With Quantities, first RICS (HK Branch) edition 1986, as the contract document. However, disclaimer clauses and time limitation clauses have been added via the supplementary conditions of Main Contract. Some other clauses were also amended.

The total net cost estimate for the project was HK$ 690 million inclusive of the HK$ 300 million prime cost sums for nominated sub-contractors. The estimator prepared the cost information for management decision.

The management used rules of thumb in the decision making and decided to add 17% on top of the net cost estimate after reviewing the facts in related to the project. The final tender sum was rounded up to HK$756 million (HK$ 390 million x 1.17 + HK$300 million).

The tender was submitted in early 1996, the main contractor was informed that their bidding was the lowest. However, the client considered that the tender sum was still too high and over their budget. The client asked the main contractor to review their tender. After long discussions between the parties, they agreed to a contract sum of HK$ 695 million. The main contractor achieved the proposed of cost saving by means of bargaining with the sub-contractors and suppliers, as well as, reducing the mark-up level.

The project commenced in August 1996. The main contractor encountered many problems when carrying out the deep basement excavation. The problems included the excavation work was carried out during wet and typhoon season; numerous large boulder were found; the excavation work was blocked by the structural strutting; and difficult site routing arrangements. The main contractor decided to erect a large temporary-working platform around the site boundary and carry out overtime. The cost of erection of temporary platform and acceleration cost have not been taken into account at the tendering stage.

Notwithstanding that the main contractor has tried their best endeavors to prevent delay to the project, the project cannot be completed in April, 1998. Finally, the architect certified, practical completion in September 1989. The project, therefore, was overrun by 153 days.

The main contractor accounted for all expenditure that they had spent in the project, they found the cost was overran by $HK 55 million. Furthermore, the client expressed that they may exercise their right to deduct the moneys due or become due to main contractor for Liquidated Damages.

Even though the final account and extension of time claims have not been settled, it is not easy for the main contractor to negotiate with the client. This may cause further financial problem to the main contractor.

In this section, the established model will be applied to the case study. All relevant information will be put into the model to assess the contract risk level. The participant team agreed that the twelve input variables should be taken into account for assessment purpose. The member of participant team further worked independently to identify the membership function of each input variable. The mean is simply taken, to represent the membership function of each input variable, in accordance with the membership function that was assigned by the member of participant team to each input variable. The twelve input variables together with their belonging membership function are listed as follows:

IV_1 : *Scale of the project*
- TIV_{16} (Large) = 0.85
- TIV_{17} (Very Large) = 0.15

IV_2 : *Complexity of Project*
- TIV_{26} (Complex) = 0.88
- TIV_{27} (Very Complex) = 0.12

IV_3 : *Contractor's experience in similar project*
- TIV_{33} (a lot of) = 0.26
- TIV_{34} (several) = 0.77

IV_4 : *Degree of Hazard*
- TIV_{46} (High) = 0.07
- TIV_{47} (Very High) = 0.93

IV_5 : *Client identity*
- TIV_{51} (Vexatious) = 0.71
- TIV_{52} (reasonable) = 0.29

IV_6 : *Architect identity*
- TIV_{61} (Vexatious) = 0.65
- TIV_{62} (reasonable) = 0.35

IV_7 : *Nominated Sub-contractor identity*
- TIV_{72} (Fairly cooperative) = 0.78
- TIV_{73} (Very cooperative) = 0.22

IV_8 : *Time Constraint*
- TIV_{81} (Very tight) = 0.91
- TIV_{82} (tight) = 0.09

IV_9 : *Risk allocation by means of supplementary conditions of contract*
- TIV_{91} (Totally transfer) = 0.98
- TIV_{92} (Partially transfer) = 0.02

IV_{10} : *Amount of Liquidated damage*
- TIV_{101} (Extremely High) = 0.01
- TIV_{102} (Very High) = 0.90

IV_{11} : *Time limitation for claim submission*
- TIV_{111} (Very tight) = 0.02
- TIV_{112} (tight) = 0.80

IV_{12} : *Payment terms*
- TIV_{121} (Not in Contractor Favour) = 0.90
- TIV_{122} (Without any amendment) = 0.10

The base rules are then developed in associated with the membership functions. Actually, the total combination of the base rule is 4096 number (2^{12}).

The first base rule is shown as follows :

If TIV_{16} : the size of project is very large
and TIV_{26} : the project is complex
and TIV_{33} : the contractor has a lot of experience in this type of project
and TIV_{46} : the Degree of hazard is high
and TIV_{51} : the client identity is classified as vexatious one
and TIV_{61} : the Architect identity is classified as vexatious one
and TIV_{72} : the NSC identity is classified as fairly cooperative one
and TIV_{81} : the Time constraint is very tight
and TIV_{91} : the risk is totally transferred to the contractor
and TIV_{101} : the amount of Liquidated damage is very high
and TIV_{111} : the time limitation for claim submission is very tight
and TIV_{121} : the payment terms are not in contractor favour

then the risk level μ_{risk} = Extremely high

If membership function of each input variable is

	TIV_{16}	(Large)	=	0.85
and	TIV_{26}	(Complex)	=	0.88
and	TIV_{33}	(a lot of)	=	0.26
and	TIV_{46}	(high)	=	0.07
and	TIV_{51}	(Vexatious)	=	0.71
and	TIV_{61}	(Vexatious)	=	0.65
and	TIV_{72}	(fairly cooperative)	=	0.78
and	TIV_{81}	(very tight)	=	0.91
and	TIV_{91}	(Totally transfer)	=	0.98
and	TIV_{101}	(Extremely high)	=	0.10
and	TIV_{111}	(Very tight)	=	0.20
and	TIV_{121}	(Not in Contractor favour)	=	0.90

then the risk level can be calculated by using the equation 3.2

therefore,

μ_{risk} (Extremely high)
= min [0.85 0.88 0.26 0.07 0.71 0.65 0.78 0.91 0.98 0.10 0.20 0.90]
= 0.07 x 1
= 0.07

In order to facilitate the extensive calculation. a computer program in Microsoft Excel is established to perform the work. The totals of 4096 number base rules have been worked out.

The output value of each base rule can be obtained in the spreadsheet. Finally, all output values will be grouped together to calculate the result of risk level using equation 3.26

Result = [1 x 0.07(1st) + 2 x 0.14(2nd) + 1 x 0.07(3rd) + ...
+ 3 x 0.02(1392nd) + 2 x 0.09(1393rd) + ... + 2 x
0.02(4094th) + 2 x 0.02(4095th) + 2 x 0.02(4096th)] /
[0.07(1st) + 0.14(2nd) +0.07(3rd) + ... + 0.02(1392nd)
+ 0.09(1393rd) + ... + 0.02(4094th) + 0.02(4095th) + 0.02(4096th)]
= 434.22 / 217.31
= 1.99#

The result of risk level is 1.99. The risk level of the project is classified as "very high" with a membership function of 0.99 and "Extremely high" with a membership function of 0.01as figure 4.

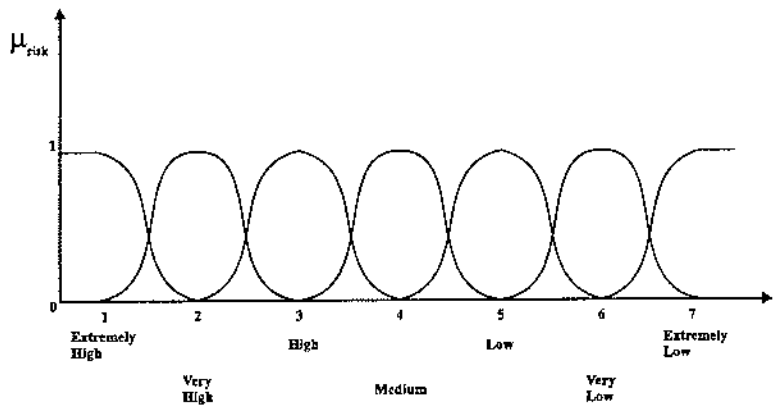

Figure 4 Membership Function for Contract Risk Decision

For the final decision, applying the equation chooses the result of risk level with highest membership function.

$$\mu RISKp) = \mu(RISK_1) \vee ... \vee ((RISK_m)$$
$$= \max [\mu(RISK_1), ..., \mu(RISK_m)]$$

therefore

μ_{risk} = [Very high (0.99), Extremely high (0.01)]

μ_{risk} = Very high with a membership function of 0.99

The risk level of the project is, therefore, classified as "very high" with a membership function 0.99.

Obviously, the risk level is not difficult to identify in this case study. As an experienced contractor, the management had noted that the risk level, for this project, was extremely or very high. They had originally added 17% on top of the net cost estimate for risk allowance. This was a very high "mark-up" level in comparing with other projects. It is because the management found that many factors were not in main contractor favor and heavy risk was allowed to their side. The management was subsequently requested by the client to reduce the tender sum. In order to win the project, the management decided to bargain with sub-contractors and suppliers, as well as, reduce the "mark-up" from 17% to 4.5%. However, it is unwise for the management in making that reduction.

The model of contract risk decision was established to assist a contractor to identify the risk level. In this case study, the risk level is classified as very high. The contractor should not agree to the request of the client, if they cannot transfer and/or minimize the risks.

Although the risk level can be assessed by the proposed model, there are many others factors influencing the bidding decision in the commercial world, including the business relationship with the parties, company's marketing strategies, company's turnover, and pressure from the shareholders. In the case study above, the contractor might have considered these factors as well as the twelve decision criteria.

CONCLUSIONS

The participants of this study supported the need to have a systematic approach towards contract risk analysis and confirmed the applicability of the proposed methodology. Nevertheless, the model described in this paper considered only the risks inherent with the contract. In reality, there are other

commercial factors that in many instances influence the final decision. In addition, the calculation and data analysis involved are considered tedious by the participants. Nevertheless, the analytical approach of the responded study put management decisions to a firmer footing. Where commercial decisions have to be made, management should be reminded of the risk involved.

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THE INTEGRATION OF BUILDING SERVICES COSTS IN BUILDINGS

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ABSTRACT

As buildings have become more sophisticated so the proportion of building cost represented by building services (M&E services) has increased. It is quite often the case that with large and highly serviced buildings, for example, for services to represent around 40% or more of the building cost (excluding land cost). It is also the case that energy costs represent a large proportion of the cost in use for the project, and have over, the longer term risen faster than inflation and may well do so in the future. For any meaningful analysis to be carried out, each building's energy requirements would need to be determined to discover how energy is to be used. From this data, all members of the design team can look at ways in which investments in capital costs can be made in order to reduce running costs, repairs and replacement changes. There is a tendency to view services as elements in isolation from the rest of the building, but of course, this is not the case, and if the building is to be designed effectively, the design of the building and services must be complementary to one another. With this in mind, both building services engineer and quantity surveyor should work together and provide better cost planning for their client. The paper reviews the difficulty in cost management of building services, and makes suggestions regarding improvement by bringing the separated quantity surveyor and building services engineer together.

Keywords: Costing; Life-Cycle Costing; M&E Services; and Teamwork.

BUILDING SERVICES

Building services constitute essential facilities to make buildings "more than shelter". Generally building services represent the totality of all amenities, facilities and utilities provided as part of the building for human convenience, and to meet specialized electromechanical functions of the building as required. The M&E services contained in modern buildings are important indicators of building quality, as they contribute to the internal environment, and the proper operations that the building is designed to house. The ever-increasing importance of building services in many of our intelligent buildings has meant that greater care and attention need to be paid towards their design, costing, installation and maintenance by the clients and their appointed building teams.

THE CLIENT'S NEEDS

Promoters want their projects to be cost-effective. Every promoter and every building project will have different criteria for cost-effectiveness. These criteria engender a relationship between time, quality, expenditure and special requirements of a project.

The design team must constantly be aware of the requirements of the promoter and the options

which are available in creating the desired balance within this relationship. In general, the following points are some of the main considerations by the design team. (They are not listed necessarily in order of importance or priority)

1. The building must be suitable for its purpose
2. Bearing function in mind the design must be economical of construction
3. The building must be capable of providing a reasonable working environment
4. Externally the building should be attractive to the occupants and to the community at large. Internally it must be attractive to the occupants.
5. The building must be easily maintained and running costs should not be excessive.
6. The initial building cost should be reasonable.
7. The building should be occupiable in a reasonable minimum construction time.

M&E services in buildings have become more complex. Clients now require a higher standard of M&E services performance and provision; and generally have higher expectations of quality. These changes in M&E services requirements, together with changes in procurement methods, shortening of design periods and the increase of specialist subcontractor design; have resulted in complications in the design, and building procurement. Furthermore, cost control of M&E services is becoming more difficult.

Construction clients have become more commercially minded, more discerning and more demanding of better performance, better value for money and faster construction.

To satisfy clients, due regard has to be taken on the need to control the design and cost of all the three elements, i.e. structure, architecture/building and the mechanical and electrical services, otherwise, the result is that the project is either overbudgeted or underfunded and the client is ignorant of his real financial commitment. Furthermore, the building might not be able to function efficiently and economically.

FINANCE CONTROL

Nowadays, rising prices, interest rates, high labour and energy cost and increased complexity of building projects have caused building clients to demand that their professional advisers should accept cost as an element in design. They should ensure that the costs are suitably balanced throughout all parts of building, and that there should be an accurate forecast for the overall construction cost during the very early stage of the project as financial sources are not always inexhaustible and a project might have to be abandoned if the building design exceeds the client's budget.

The successful financial planning and control of any building project demands the close understanding and co-operation between the consultants, architect, building services engineer (BSE) and quantity surveyor (QS) - their aim is to satisfy all the needs of the client within his financial limits.

Therefore, it is important to have:

- Setting up and approval of budget at the inception and feasibility stages.
- Cost checking of design against budget in the design stages. If the estimate of an element exceeds the cost target, adjustment will have to be made until the cost target is reached. On the other hand, if the estimate is less, then better quality systems and materials can be provided, or the saving can be used to improve other elements.

The cost of a building will mostly spent on the following three major building elements:
1. The architecture
2. The structure
3. The M&E building services

The whole building design team should control the cost of the project within the client's target right from the beginning and throughout the whole design and construction period. It is surely a team effect rather than individual.

For traditional types of development, all the major decisions relating to functional requirements, building form and conceptual design of all M&E services are mostly made in the early design stage. The early design stages are therefore, crucial in establishing relationships between cost and quality, as by the time the sketch design is developed, much of the cost is committed. The ability to influence the remaining decisions is probably limited to 20% of the final cost.

Building services have an important impact on the design of a building. The sitting of the energy centers, design of services systems and building enclosures, accommodation of M&E services, etc - all these and other interrelated building and structural elements are fundamental both to the costs of the building services and the design of the building. A bad decision at this stage may involve considerable additional costs at a later date and therefore the most economic solutions to these problems must first be established. No doubt, subsequent amendments to the engineer's proposals will be required, but the most economic solutions will have first been established and later changes should show compensatingly greater advantages in other directions. Of course, the client's limited budget may not always allow the engineer to have the best choice and, therefore, compromised solution must be adopted (e.g. cheaper air-cooled chilling versus expensive sea water chilling plant) under this circumstance.

BUILDING SERVICES COST

Recent research in Hong Kong and other countries indicates that building services will account for 20 to 50% of the total cost depending on the type of building. This high cost is, however, mainly managed and controlled by the quantity surveyor with little help from the building services engineer in many instances. This is fine, as long as the QS knows building services. However, does the QS know anything about the 30-50% or so large share of the project that he is supposedly controlling? The answer is that some of them do. Still many QSs who currently provide cost controls do not have the broad background, and in many cases are stretched when it comes to detailed cost planning of building services. The building design will have a direct bearing on the design of building services for a particular building, and therefore, building services costs control cannot be treated in isolation from other building elements.

PROBLEMS IN COST MANAGEMENT OF BUILDING SERVICES

The problems faced by quantity surveyors attempting to forecast and control the costs of building services are acknowledged widely. Some of the critical problems are:

- Difficult prediction of accurate building services cost during the early stage of a project
- Difficulty in controlling building services costs during the design phase in which options must be fully analyzed together with other building designs. Any change in either the building layout/structure or building services will upset the cost plan.
- M&E services are difficult to estimate as cost is related to design standard, complexity of building and building services, and special requirements as needed by the authorities having jurisdiction on the systems.

- Most parametric techniques (e.g. $/m2, $/M&E major component and cost/cooling ton or heating kw) do not reflect the actual need, and estimation of costs based on these techniques can produce seriously flawed cost plan if full details of the M&E services design have not been carried out.
- Difficult to analyze tender submissions, as technical details must be fully examined in conjunction with tendered prices.
- Difficult to evaluate some variation orders which are technically oriented and basic/standard unit rates can no longer serve this evaluation.
- The time needed to complete the M&E services element is usually beyond the QS experience.

These problems have multiplied rapidly in recent years with the increasing levels of sophistication now being incorporated into our many large and complex intelligent buildings. Obviously, the problems will affect the quantity of good professional service that the engineer and quantity surveyor are offering.

Cost forecasting for M&E services has been less than satisfactory in the past. Research into the existing methods of cost planning M&E services has revealed that early stage cost estimates for M&E services are generally based on the gross floor area of a building, and concluded that this is inappropriate. The early stage cost estimates are also separated from the concept of integrated design and whole life-cycle cost.

Most of the problems can be tackled by close working between the QS and BSE. In my opinion, no single person can handle this joint-venture task, even we have the specialist M&E quantity surveyor, he or she still has to work closely with the engineer since design and costing must be considered altogether.

It is good to hear that there are cases that some quantity surveyors, engineers and architects have contributed their knowhows in the provision of prestigious projects and excellent M&E services designs which all have both time and cost constraints. The answer to the success is good teamworking and short-term partnering.

CONTRIBUTION OF QS ON BUILDING SERVICES COSTING

From research result, it has been identified that many quantity surveyors are not currently perceived to have the specialist expertise to provide satisfactory cost advice on building services (of course, there are exceptional cases). Furthermore, quantity surveyors generally have been slow to specialize to the extent needed to take up a leading role on M&E services work. It has also been identified that good cost control demands proper understanding of the complex design of services and all building elements.

For best project result, advice on building services cost should not be a separate QS service, and QS should provide good building services cost in conjunction with the construction cost. Also, M&E services must not distinct from construction. If we still demand fully integrated building, services should not be examined in isolation from other elements in a building as they are often very much interrelated.

During the design development stage, both QS and M&E services engineer should work together and provide good cost management. At this critical stage, proper value engineering and cost control should be implemented for best management. However, the quantity surveyor's lack of in-depth knowledge of complex building services technology is a problem. It poses the question of how far the cost management of building services can be done if the QS is fully responsible for all cost matters. Unfortunately, the findings from the author's study of management of building services design indicate that notwithstanding the large financial value of the M&E content in many buildings, cost management of building services is still an area where QS weakness needs to be rectified. It is also noted that some services engineers still think that they are more capable of handling the M&E cost control, but often

handle the cost control in isolation from the other elements. As costs of building and building services are very much interrelated, therefore, cost control cannot be managed by just one member of the building design team, and a team effort is needed. By and large, in many instances, the QS is only able to control costs effectively for about 50-70% of a project, and control of M&E services costs is out of his hand. Then the entire cost control function for the whole project becomes questionable. Surely, there is little real merit in properly controlling only 50-70% of the contract value if the remaining part is not also subject to the same stringent requirements. Obviously, our clients are certainly not receiving good service from the divided professionals.

THE INTEGRATION OF SERVICES IN BUILDINGS

Cost management is not compilation of costs based on some standard figures, it has to be linked between cost estimating, planning and design of building. It must also be highlighted that the target is not just a low cost building but the building product must achieve more and quality, value for money and functional performances of the building and its M&E services must also be fully considered. Last but not the least, the initial capital cost for the entire building must, of course, be affordable to the owner.

LIFE CYCLE-COSTING

Several years ago the only cost consideration of the client was to reduce the initial construction costs to a minimum. Clients are now more enlightened and do attempt to take into account the three 'R's: running, repairs and replacement costs. These should be considered alongside the costs for the initial construction work. The emphasis, therefore, particularly of owner-use clients, is now often on the basis of an economic life-cycle cost, in preference to the cheapest possible constructional design. The introduction of energy-saving measures within the design in order to reduce future fuel costs is now commonplace. The disadvantages and disruptions caused by major repairs and maintenance can also often result in costs out of all proportion had a better services design been chosen initially. It must also be remembered that the most expensive type of construction initially does not always result in a saving in future costs. Sometimes the reverse can be true where, for example, an expensive automated system can require a high allowance for future maintenance expenditure.

Annual costs associated with the utilities, operation and maintenance must be within the owner's budget. Further, the design team must address the Green Building issues. To complete all these tasks, a well-organized and co-operative team of building professionals must be of paramount importance. All members must contribute their special knowledge and work together to achieve the identified goals - a building that the client wants and he can afford.

USE OF BUILDING SERVICES COST PLAN

A cost plan (detailed cost of each building services system) provides the means of controlling the progressive design of the building so that the complete scheme may be built within the money allocated (e.g. 35% of the total cost of building to be spent on M&E services). If there is no cost plan, the detailed design of the building proceeds uncontrolled and the obtaining of tenders within the cost allowance becomes a matter of chance.

The cost plan also provides the basis upon which the costs of alternative designs (e.g. individual A/C system for each storey rather a central system) may be compared and this plan must be available to answer the numerous detailed questions which arise during the design stage.

Alternatively, design problems affecting both building and engineering items may arise and their consideration requires not only detailed comparison with the cost plan but also close working co-operation between the engineer and quantity surveyor. If there is no comprehensive cost plan, reliable and worthwhile financial advice on alternative designs within the framework of the cost allowance is not possible.

EXAMPLE OF INTEGRATION BETWEEN QS & BSE

Because services are sometimes viewed as distinct elements and separate from the building, it is possible to fail to consider the consequential effects on the actual building itself, of using say one type of air conditioning system as opposed to another type, in terms of both indirect cost of the building element, initial and running costs of building services. For example, if it were decided at the feasibility/ scheme design stage to install air conditioning into a building that had not been designed to take it, then it would normally be necessary to alter the building design to accommodate this installation.

Below is a case study for such an exercise which would need to be carried out by the quantity surveyor in order to amend his initial estimate to accommodate the installation:

A client is considering developing a site with an office building. The initial design envisaged a traditional 5-storey building with simple ventilation. It is now considered that local demand is stronger for more up-market offices which have air-conditioning and raised floors.

The budget estimate for the original building was US$5,200,000, which included all elements. Preliminary cost studies have shown that the additional cost of the air-conditioning would be US$732, 000 and the raised floors would be US$285,000. On the basis of the new proposal, the client has agreed that the budget can be increased to US$6,300,000 which includes additional costs brought about by the air-conditioning installation.

The architect has discussed these changes with the services engineer and has decided that the storey height will need to be increased by 0.75m to 4.25m. No other variations to the quality of elements are considered necessary.

A point that needs to be noted is that, for proper cost control, the use of a simple figure of additional cost for A/C is not satisfactory. What is required is the preparation of a revised budget estimate which takes into account changes to the proposed building.

First of all, the revised height represents an increase of over 21% on the original and this increase will affect all elements which have a vertical component, as well as increasing the dead load of the building. Secondly, profit, attendance and any builder's work required will need to be added to the quotations. Thirdly, it is reasonable to assume in this case that the increase in storey height is for the inclusion of the air-conditioning ducts and the raised floor. The floor to ceiling height will remain unchanged.

Having gone through all the aforementioned items, a QS would estimate all related costs. Revised estimate would then cover the impact of A/C on:

- Structure - increased windload
- Frame - vertical component
- Roof - load due to A/C, plant
- External wall and window - increased area and perhaps revised design
- Internal wall and finishes - increased areas
- Ceiling - some change for A/C
- Electrical services - additional distribution for A/C

- Ventilation - forms part of A/C
- Builder's work & attendance on services - additional allowance to be made
- Preliminaries - same

The revised estimate is now US$6,500,000 for the whole project and the original budget (6,300,000) is no longer adequate. Clearly, the cost of building services cannot be examined in isolation from the building elements since they are often very much interrelated.

RECONCILIATION OF CASE STUDY

This case study indicates the approach which might be taken in revising an elemental estimate at an early stage. It shows the interrelationships which exist between many of the elements of a building. This example also demonstrates the substantial effects of the introduction of services elements of this type into a building and the assumptions which a quantity surveyor may make when estimating costs at such an early stage of a project. Surely, both the architect, engineer and QS would have to sit together and discuss the redesign of the building enclosure in order to further reduce the cost of the A/C system. It is also clear that any decision made will also increase the costs of the building enclosures.

Based on the revised estimate, the allowance covered for the "additional costs" over and above the costs for the air-conditioning and the raised floors, is not enough, in spite of the savings on windows (not needing to be opening) and the ventilation systems being replaced by the introduction of air-conditioning. This illustrates the danger of agreeing to what might appear to be a reasonable figure at first glance, whereas in reality, it might prove to be difficult to achieve. Also we should be aware of "life cycle costs" of installations rather than considering initial costs, or running costs in isolation. The "knock on" effects on the other building design should also form part of any consideration. For example, providing air conditioning in a building can add substantially to construction costs, as we have seen, the A/C equipment also takes up large amounts of floor space which otherwise may provide income; again this should form part of the overall consideration.

It must be stressed that the building services engineer should also carry out a detailed cost estimate for his A/C system as it is no longer reliable to base on any rule of thumb method (e.g. $ per TON of cooling, etc.) if we have to offer good cost advice to our client.

This example demonstrates the wide ranging effects of the introduction of air conditioning into this building. Many elements were affected, although mainly vertical components, the affect on cost was significant. It shows the need to consider carefully the consequences, over and above the services installation itself, of making such changes, the indirect effects are often not immediately obvious but nonetheless can add substantially to the overall cost. An example of this is the need for a window cleaning cradle because of the need to have sealed windows with air conditioning.

IMPROVEMENT IN BUILDING SERVICES DESIGN COST PLANNING

Perhaps, one might have to look at Value Engineering at this stage where changes can be easily made and more cost-effective. We have to look critically at what we can do, the objective being to provide the same or possibly higher level of performance at a reduced cost if possible. Some services elements are difficult to alter because there are few if any alternatives. However, in the fields of energy management there are increasingly many new products which come onto the market, and if we are to give an effective service to clients, surveyors need to be aware of them.

It follows from the above that if we could dispense with some of the services installations completely or perhaps reduce the amount of services it may be possible to reduce the cost of some building

elements (the reverse of including air conditioning). There have for example, been a number of buildings constructed over the years which have been built with extremely high insulation levels and sunshade controls.

The initial costs of very high levels of insulation, etc. is going to be expensive, but it is a "one off cost". It should also be remembered that the savings which arise are not just from the running costs but also from maintenance, decorating and renewal costs.

As previously mentioned, services in buildings are often considered as an after thought elements which are important, but where it is their performance which is important rather than their visual effects. This being the case, they are often hidden wherever possible, quite often with little or no thought to their maintenance or renewal. The potential problems and costs involved with repairs or renewals are fairly obvious. I am sure you will have seen many such examples where little thought is put into the future needs of the installation. It is often the case that the architect and engineer will be "long gone" before the problems arise. In terms of life cycle costing, for a building to function effectively and efficiently over time, consideration must be given at the design stage for the need to maintain and replace installations.

This approach of course requires increased awareness on the part of clients and architects of these factors. However, in the provision of cost advice it can be pointed out what the consequences can be of a failure to appreciate the future requirements of installations which often have a life of 15 to 20 years.

The installation of such important element of a building needs very careful consideration not only in terms of its functional performance but also its capital and running costs, the consideration of possible alternatives as well as maintenance and renewal. The services engineers and surveyors are important in providing the specialist knowledge in these areas and it can often be the case that slightly higher capital costs and amended designs may well overcome substantial future problems.

CONCLUSIONS

It is true that the current methods of early cost advice/cost planning of building services are not perceived as satisfactory by clients as costs are not accurate and costing and design of M&E services are treated in isolation. The obvious reasons are limited knowledge in complex building services engineering by most quantity surveyors and the inefficient working between the QS and services engineer.

The ever-increasing importance of building services has meant that greater care and attention need to be paid towards their cost implications. It has resulted, on large projects at least, in necessitating the role of a specialist M&E services quantity surveyor who will fill the gap between good cost control and design of services.

Most problems cited in this paper can be overcome by the QS and building services engineer. Both professions are equally important but must reengineer themselves and consider mutual respect and co-operation between professional and work as partners.

An important point that needs to be noted, is that the greater the capital cost expenditure on services, then this is likely to have higher increase in the cost-in-use of the property. It must be emphasized that better design and costing of building services and building should be provided by both QS and BS engineer. It must also be remembered that although there is a great demand for cost-effectiveness of the building and its building services, all these must be balanced and tempered with the need to satisfy the project's special requirements, time, cost, quality and other needs. Clearly, it will not always be possible to have the best services or building design in order to meet the actual need of the client who might put time and capital cost as his high priorities. Nonetheless, both QS & BSE have to explore all

possible designs and cost analyses, and let the client have a clear picture of his project, and offer him the best advice on costs and designs.

Most importantly, both QS & BSE must pretend that they are the clients, and it is their own money, and they will surely get a better cost management of building services.

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COST PLANNING AND CONTROL IN HONG KONG: CURRENT PRACTICE AND THE FUTURE DIRECTIONS

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ABSTRACT

The local property market has experienced a slump after the Asian financial crisis. Monitoring construction cost becomes more critical than ever with the reduction in profit margin. It has been suggested that the commitment of construction cost prior to a sketch design being formalized may amount to over 80% of the final potential cost (Ferry et al. 1999). Cost planning and control, especially during early stage is crucial to ensure good value for money for a proposed property development. Review of current practices suggested that the effective use of cost planning and control may be affected by insufficient involvement of cost planner during the design process, inadequate fee allowance, haphazard cost advice and the estimating approaches used. This paper suggests several directions for improvement of the cost planning and control service. These involve the establishment of a systematic approach and procedure, the adoption of more advanced forecasting models and techniques such as whole life costing, value analysis and management, and expert system.

Keywords: Cost planning, Cost control, Hong Kong

INTRODUCTION

Cost planning and control is one of the core services provided by quantity surveyors. Although cost planning and control exercise have been adopted by most construction clients in Hong Kong, nevertheless, the benefits that can be derived from these cost monitoring systems may not be fully recognised by the users. Broadly speaking, cost planning involves the interpretation of cost data taken from cost analyses or returned tenders. This may easily be misinterpreted as an extension of cost estimation. In this regard, cost planning comes to an end once the contract is awarded. However, cost planning and control system in fact serves to ensure value for money for a property development. Hence there is a need to review the current approaches and procedures used. Application of new techniques and models should also be studied with the aim of enhancing the cost advice function of quantity surveyors. Several directions for further development are summarized in this paper.

FUNCTIONS OF COST PLANNING AND CONTROL

The purposes of building up a cost control system include (Flanagan et al. 1997):
- To give the client good value for money;
- To achieve the required balance of expenditure between the various parts of the building;
- To keep expenditure within the amount allowed by the client.

It appears that the focus of cost planning and control in practice has been placed on the third purpose. However, more concerns should be placed to observe the other two purposes.

It is undeniable that the success of a development is often related to the profit generated, this is so at least from the clients' perspective. Before the financial crisis in 1997, construction cost constitutes a relatively small portion of the total cost of private property developments. In this respect, departure from budget (for construction cost) is generally tolerated as it can be absorbed by the profit cushion. However, the Hong Kong property market turns sour after the Asian financial crisis in 1997. The percentage drop in the prices of land and the property prices is far greater than that of construction costs. The profit margin of private property developments therefore is significantly reduced. In this respect, controlling construction cost becomes critical as it directly affects the profitability of a development.

Cost planning and control exercise is also applicable for projects where profit may not be the prime concern. Every development has a budget limit and ineffective expenditure may affect the performance of the completed product. Cost planning and control exercise may also be extended to cover the life costs of building. This is highly relevant to public sector developments as best value in terms of life cycle of building should be the prime consideration for public clients.

COST PLANNING PROCESS IN PRACTICE

General Process

In the very early stage of a development for examining the inability of a proposed development, a developer need to know the probable construction cost. At that time, no drawing is prepared yet and the only reference for the likely cost is the standard of the proposed development. Usually, a developer will benchmark the standard of the proposed development with another completed development in the market. The quantity surveyor will then be asked to provide an indication of cost usually calculated based on cost per floor area of similar buildings basing on historical cost analysis. The estimated construction cost usually becomes construction cost budget.

Alternatively, the developer may use the accepted profit margin as a base and work backward to derive the maximum allowable construction cost budget. This cost budget is often checked by the quantity surveyor to see whether it falls within the construction cost range of developments of similar standard.

Having established the construction cost budget, the client will decide whether to proceed with the proposed development after considering the overall cost of development, the market situation and the target return.

Upon a decision to proceed is made, the architect will start to prepare drawings and specifications, based on which the quantity surveyor will provide cost estimate. The sophistication of the cost estimate depends on how detailed is the design information provided as well as the time available for its preparation. Generally speaking, if no drawing or only very sketched drawings are provided, estimate will be based on floor area or functional unit method. If layout and elevation plans are provided, thus allowing the quantity surveyor to prepare the elemental quantities, an elemental cost estimate can then be provided. At a later stage, when further detailed drawings such as the framing plans are provided, approximate quantities method can be used for a detailed estimate.

During the development of design, either at the request of the client or the architect, the quantity surveyor may have to evaluate the likely cost implications of design options. This kind of cost study is

mainly done on an ad-hoc basis, typically performed in a cost-cutting exercise where the estimated construction cost is found to exceed the client's budget.

When tender drawings and documents are prepared, the quantity surveyor will have to prepare a pre-tender estimate. The estimate involves the pricing of bills of quantities based on historical rates from other current similar projects. It acts as a datum for cost reconciliation of returned tenders.

Timely and Sufficient Information Available for Production of Cost Plan

As mentioned earlier, the purposes of cost planning and control are to ensure that money spent is of good value, appropriate cost allocation and ensuring construction cost is within the allowable budget set. To achieve these purposes, timely availability of information from the architect and engineer is vital as the accuracy and reliability of a cost estimate are very much related to the degree of detail contained in the drawings. In addition, drawings logically developed, both in order and design details, enable the cost plans so prepared be used for cost control function as it would be far more easier to track the cost implications as design develops. However, information is rarely provided in stages as those described in the RIBA outline plan of works and it is very common for the quantity surveyor to adopt a mixture of methods to prepare cost estimates. The disadvantage of estimates prepared using a mixture of methods is the increasing possibility in double counting items and missing items.

Haphazard Cost Advice

It is not difficult to note that the initiation of producing an estimate by the quantity surveyor depends very much on the request of the client and the information provided by the design team. There is a lack of framework to monitor the development of cost plan. The result of this are that estimate and cost studies produced are piecemeal in nature, and cannot perform the function of a control document for the cost aspect of the design development.

Earlier and Direct Appointment by Client

It is not uncommon that the quantity surveyor is appointed much later than the appointment of the architect. This is particularly so where the quantity surveyor is being appointed as the sub-consultant for the architect. Since design decisions in early design stage (prior to a sketch design) may govern over 80% of the final potential cost (Ferry et al. 1999), the late appointment of the quantity surveyor deprives early cost advice. Where the quantity surveyor is being appointed as the sub-consultant for the architect, the situation will be even undesirable because it will be very unlikely for the quantity surveyor to give independent cost advice.

Review of Fee Structure

The benefits of cost planning and control are undervalued as evidenced by the fact that preparation of cost plan is either charged at a very small portion of fee. It is not uncommon that cost planning service is provided free. This would affect the cash flow of the practitioners where significant effort is devoted but can only recover the cost at a much later stage of the project or even cannot be recovered any at all. Clients realising the benefits that can be derived from cost planning and control perhaps will accept the need to pay for this service.

A SUGGESTED COST PLANNING AND CONTROL SYSTEM

Although the term 'cost plan' in practice may mean 'estimate', it is suggested that cost plan differs from traditional estimate in its functions (Flanagan et al. 1997). The cost plan can be viewed as a statement of how the design team proposes to distribute the available money among the elements of the building. It is being referred to throughout the design process. It helps the design team to detail the design within a cost framework. Flanagan et al. (1997) also propose three key components of a cost control system: (i) there must be a frame of reference, (ii) a method of checking, and (iii) a means of remedial action. A better approach of cost planning and control is suggested based on these principles.

When sketch plans are produced, the quantity surveyor shall prepare an estimate based on the drawings and recent elemental cost analyses of similar project. The estimate would be used as a cost plan and the estimated cost for each element would be the cost target. The sum of all cost target together with the contingencies equals to the cost limit. The cost plan itself provides a frame of reference. As design develops, the estimated cost of each designed element is compared with the established cost target i.e. cost checking of each element. If the cost of element design is greater than the respective cost target, the element design should be changed so that it is within the cost target. Nevertheless, if the cost check of the element design shows that the cost target is unrealistically low, it should be adjusted upwards. The quantity surveyor would then need to identify surplus from the other cost targets for this upward adjustment. The flexibility provided for adjustment of cost targets is the means of remedial action. In any case, the cost limit should not be altered so as to keep the expenditure within the client's budget.

As the cost plan is developed in line with the design, the main advantage of this is that it ensures efforts devoted by not only the quantity surveyor but the whole design team are on the right track. Cost plans produced under this approach avoid the problem of giving haphazard cost advice and the improper distribution of cost among building elements.

DIRECTIONS FOR FURTHER IMPROVEMENT

The role of cost advisor is fundamental to the profession. In the client's mind, quantity surveyors should understand very well how costs are incurred in the building process in order to perform this properly. The development and application of new model and technique that improve accuracy and consistency of cost forecasting become crucial because accuracy and consistency are the two major criteria for measuring the quality of cost forecasting.

Apart from the direction of improving the accuracy and consistency of cost advice, more efforts shall also be devoted to extend the scope of cost advice by considering the life cycle cost. The advantage of incorporating the life cycle costing exercise in the cost planning process is that it gives clients the best value option not only in the perspective of construction cost alone but the total cost incurred in the whole life of buildings. Thus, it avoids making short-sighted design decisions.

One of the main reasons for the late appointment of quantity surveyor and the low fee for the cost planning service is that clients do not fully recognise the benefits of the service. The ultimate goal of the service shall be focused on ensuring money spent by clients is of the best value. This matches with the philosophy of value management suggested in this section.

Model and Technique

More advanced technique should be used. Existing approach seldom take into account of the construction characteristics. Cost information from the Bills of Quantities with adjustments is based on the concepts of supposition and presumption (Ashworth, 1986). As no two projects are identical and each contractor has his own pricing technique that the unit rate for an item may represent different cost components in

different cost analyses and different returned tenders.

Accuracy and consistency are two primary measures of the quality of forecasting. Some construction cost forecasting researches suggested adopting mathematical models to improve the forecasting quality. One of the most well studied techniques is regression analysis. Regression analysis is used to determine a formula or mathematical model which best describes the data collected. The application of this technique is to identify the determinants of construction cost. For example, the height of building could be a factor affecting the unit rate for concrete but this would not be encountered in the traditional model. Although there is an opposite opinion concerning the number of unknown variables in construction works which deters its application, the technique helps studying the correlation between observational variables and construction cost. For instance, one of direction proposed in this paper is to apply this technique in the future to study the relationship between building shape, storey height and building height, and the construction cost. Their correlations are suggested by James (1954) but have not been statistically tested. The benefit of the proposed model, namely storey enclosure method is to give the designer a picture of how the design variables attribute to the construction cost during early stage design.

Risk Analysis

Instead of building up the cost plan from one cost analyse, a set of historical price data is drawn from several buildings. Quantities are measured based on drawings provided and the corresponding unit rates are represented by sample means of relevant price data. Probability distributions of unit rates as well as the overall forecast cost could be obtained. Risk analysis could be performed in a number of ways. The most common one is the Monte Carlo simulation technique. Monte Carlo simulation studies the relationship between an estimated cost and the probability of derivation from the estimated cost.

Cost plan produced with the application of risk analysis technique would be able to show (Flanagan et al. 1990):

- The probability that the contractor's tender price will not exceed the consultant quantity surveyor's price prediction;
- The most likely range with which the contractor's tender price will be

The advantage of adopting risk analysis technique in the cost planning process is to encourage the design team to consider contingency plans to cater for situations within the range of possibilities. However, in order to build a good probabilistic model by simulation, it demands a large pool of data that is properly maintained.

Life-Cycle Costing

Life-cycle cost of a facility comprises the present value of the total cost of a construction project over its operating life. This includes the initial capital cost, running costs, maintenance costs and the disposal cost. The rationale in appreciating the life-cycle costs lies on that the construction cost is only part of the whole expenditure and evaluation purely based on it is unsatisfactory.

It is believed that a life-cycle cost plan with proper consideration of the whole-life cost is likely to offer client better value for money in long term. It could also be used as a control document to evaluate the cost-in-use. To account for the time value of money in the life cycle cost plan, cost information is either discounted to a net present value or an annual equivalent.

Life cycle costing assessment is also subject to criticisms. One of key critics is that prediction of future with huge numbers of unknown is very difficult, if not impossible. In the life cycle cost plan, it contains many assumptions such as for discount rate, inflation, life of building and repair cycle, etc. A minor deviation of each of the assumptions could amount to large deviation from the actual cost. In

many situations, the clients may have no intention to know the cost-in-use at all. This is obviously true for development that aims at generating profit unless the clients see the benefit from considering cost-in-use such as for the sake of marketing.

Cost in the future need not be guesstimate. The handling of uncertain elements can be through sensitivity analysis and probability analysis. Sensitivity analysis is a deterministic method that shows a portrayal of outcomes based on different values of assumptions. The technique helps to determine the possible risks associated with the development. On the other hand, Monte Carlo simulation could be used for probability analyses that all variables subject to risk are modelled as probability distribution rather than as determined single values.

Value Management

While the objective of cost estimating is to answer the question of 'What is the probable cost of a design?', value management concerns the question of 'What does a component do?' and 'What is the optimal way to do?'. Value management is a philosophy which centres on the identification of the function of a space or a component and concerns with the delivery of a product meeting the needs of the customer at the required quality and the optimum cost.

The process of value management begins with the client explaining his own brief to every member in the project. Through this exercise, every member shall clearly know the client's requirements. When sketch design is completed, it will be reviewed by another design team or namely, the value management team in a workshop. The team composes of professionals from different disciplines and is chaired by the value manager appointed by the client.

The workshop is a structured programme that takes about a week to complete. The value management team will perform a series of operational steps. They will first identify the function of each building component. Then, each design team member will be asked to brainstorm the ideas for all possible solutions to identified functions. All ideas are welcomed without criticism until the judgement phase. During the judgement stage, several essential requirements such as initial cost, aesthetics and performance will be identified and weightings will be given to each of them. The ideas will be marked according to their performance. Total marks for each idea is obtained by summation of the products of weightings and marks. Technical feasibility and economic viability will be studied among the accepted ideas and only ideas that are technological and economical sound would be recommended to the project management team. The project management team have the right to reject the recommendations provided they have sufficient grounds and they may further discuss the recommendations with the value management team.

Since the majority of final potential cost is committed prior to a sketch design being formalized, there is a high probability of cost saving without sacrificing the quality. In fact, it was suggested by the Value Managers from the North America that at least 10% saving would be realised by the application of value engineering to make design decision to any project (Kelly et al. 1990). Other advantages are that the solutions can address to both initial and life-cycle cost and there will be a fixed date for completion of sketch design.

Quantity surveyors who have a strong background in the cost aspects of construction should be able to extend their services in the area of value management.

Implication of Information Technology on Cost Planning

With the development of Information Technology, information such as quantities can be generated simultaneously with drawings. Efforts shall be made in the future to integrate design data. The data integration is an industry-wise issue that professionals from any single discipline could never do it alone. It is believed that if quantities could be automatically generated from computer, quantity surveyors

could then concentrate their effort on cost modelling.

Another area of information technology application is the use of expert system. An expert system transfers the expertise of the surveyor to the computer. This is particularly helpful when handling a large pool of data where human brains are not capable to handle it well. This situation is particularly true for the application of mathematical model like Monte Carlo simulation.

Under a knowledge-based expert system, simulation models for components of building are constructed basing on parameters input such as location of site, building type and nature of client (Kelly 1987). These parameters would form constraints to factors such as transportation; wastage and material finish that affect cost of the component. A pool of data is then collected to generate the rule which shall be statistically tested. The validated rule become a part of the knowledge base of the expert system for a project which helps designers to make decision on cost. Since rules and parameters could be traced from the expert system, it improves the transparency and explanation facility for advanced cost model.

CONCLUSIONS

Effective use of cost planning and control is essential to achieve value for money. This paper suggests several directions for improvement in proceeding cost planning and control service by quantity surveyors. These include wider use of life-cycle costing, value engineering and IT tools. With life-cycle costing exercise, the whole life cost of building is forecasted instead of the construction cost alone. This exercise is more suitable for public works that the cost-in-use is highly relevant. Value engineering is a proactive way of planning and control cost. It is believed that this ensures money spent is of good value which is the obvious benefit to the client. With the advances in IT, data management can be far more efficient. Integrative approach involving drawing preparation to costing designs would be forthcoming.

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THE IMPACTS OF INTERNATIONAL CASE LAW FOR 'TENDERING CONTRACT' UPON TENDER PROCUREMENT PROCESS

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ABSTRACT

Recent international case law has indicated that a 'Tendering Contract' may arise between the tenderer and the owner upon the submission of a conforming tender. Under this relationship the owner has a contractual duty to treat all tenderers equally and fairly in the selection process. During the tendering process tenderers may suggest alternative solutions. Clearly clients are keen to take advantage of these opportunities, and equally contractors want to use their expertise to establish competitive advantage. However, recent international case law has raised doubts about the ability of owners to seek alternative bids without placing themselves at risk of compensation to those who only submit the conforming tenders. The recent Canadian case of "Ron Engineering (1981)" and the New Zealand case "Pratt Contractors Ltd v. Palmerston North City Council (1995) " have established the owner's duty of fairness to all bidders. This duty is commonly breached when an owner accepts an 'alternative tender', which does not conform to the conditions of tender. On the other side of the fence, tenderers should also be wary of conditions such as validity of tenders. The case of City Polytechnic of Hong Kong v. Blue Cross (Asia-Pacific) Insurance (1993) has seen the tenderer liable for damages for withdrawing his tender before the tender validity period expires.

Keywords: Tendering Contract, Conforming and Alternative Tenders, Validity Period

INTRODUCTION

During the tendering process for most major construction projects there is an opportunity for bidders to suggest alternative solutions. For example the seven bidders for the new parallel runway at Sydney Airport all submitted alternative proposals with the winning bid incorporating alternatives adding up to savings of A$30m over the tender design. (Richards 1996). Clearly clients are keen to take advantage of these opportunities, and equally contractors want to use their expertise to establish competitive advantage. Research by Lenard et al (1996 and 1997) into the drivers of innovation in construction has concluded that long term benefits are more likely to be realised if the industry moves towards a culture based on competitive advantage through innovation rather than price competition.

However, recent construction case law has raised doubts about the ability of owners to seek alternative bids without placing themselves at risk of litigation. Generally the owner was

unrestrained in how tenders were assessed and the award of contracts made. But recent decisions of the Supreme Court of Canada in "The Queen in Right of Ontario et al v. Ron Engineering & Construction Eastern Ltd (1981) SCR 111; 119 DLR (3d) 287, 272" case and the High Court of New Zealand in "Pratt Contractors Ltd v. Palmerston North City Council (1995) 1 NZLR 469" have established the owner's duty of fairness to all bidders. This duty is usually breached when an owner accepts an 'alternative tender' which does not conform to the conditions of tender.

The aim of this paper is to investigate the implications of recent international construction case law concerning the existence of a "tendering contract" on the opportunities for clients to encourage innovative alternatives when inviting bids from contractors. Consequently owners will have to be very careful how they frame their tender documents.

TENDERING PRINCIPLES & IMPLICATION OF TENDERING CONTRACT

A tendering arrangement is basically a contractor selection process, usually through competition from open invitation, selected or pre-qualified tenderers. Kwakye (1994) defined tendering as "an offer from a Contractor to do certain work for a price which he names, usually in a priced bill". Under the principles of law of contract, a simple contract is a legal binding agreement between two or more parties and is supported by consideration. Unless and until an offer is properly accepted by way of conduct or written confirmation, there will not be any contract between the parties. Accordingly, the tendering process has been regarded as no more than 'an invitation to treat'. The owner can reject or accept tenders as he pleased or could negotiate with one or more tenderers to produce a satisfactory deal. Generally the owner is unrestrained in how tenders are assessed and the subsequent award of contracts made. In fact, many conditions of tendering do not really contain any information about the tender assessment criteria.

However, this traditional position has been changed by the decisions and rulings made in several international court cases. It is held that a 'Tendering Contract' exists between the tenderer and the owner upon the submission of a tender. Under this relationship the owner has a contractual duty to treat all tenderers equally and fairly in the selection process. In his book of Procurement Law, Craig (1999) defined 'tendering contract' as "....a contract brought into being automatically upon the submission of a responsive tender." This duty is usually breached when an owner accepts an 'alternative tender' which does not conform to the tender conditions. Bids must therefore be rejected that do not comply with the tender call. Procurement codes or conditions of tendering do not typically provide clearly for an independent innovative solution from any one bidder in response to the tender call. The principle behind the so called 'tendering contract' lies in the fact that if the owner accepts an alternative tender which is not clearly defined in the tender documents, then he would be unfair to tenderers who only submit conforming tenders all in accordance with the tender requirements. Therefore any departure from the conditions of tender by the owner risks allegation of unfairness to the tenderer(s). The owner's obligation to be fair to all tenderers should not be compromised by bad project management. If he does accept an alternative tender that was non-conforming, he will be liable in damages to the lowest conforming bidder.

SUMMARY OF THE COURT CASES & THEIR IMPACTS

The existence of the 'tendering contract' has been held from the court cases but the detailed principles behind have yet to be fully investigated, developed and understood. The following Table 1 includes a summary of the international court cases where tendering contract has been established:

(Table 1) International Court Cases	Summary of Results
(1) The Queen in Right of Ontario et al v. Ron Engineering & Construction Eastern Ltd (1981) SCR 111; 119 DLR (3d) 287, 272	It was decided that a *contract* was automatically brought into being upon the submission of a responsive tender. Ron was in breach of a *tendering contract* when it revoked its tender offer, enabling the owner to claim for damages.
(2) Calgary (City of) v. Northern Construction Co (1987) 2 SCR 757	The judgement was governed by the Ron Engineering's case of formation of a 'tendering contract'. Each tenderer, by its tender, expressly agreed not to revoke its offer within a stated period or prior to acceptance of a tender by the owner. The owner's remedy against the tenderer is damages for withdrawal of the tender, the amount being the difference between the revoked tender and the next lowest bid.
(3) Blackpool & Flyde Aero Club Ltd. *v.* Blackpool Borough Council (1990) 1 WLR 1195	The invitation stated that the Council did not bind itself to accept any tender and that late tenders would not be accepted. The English Court of Appeal held that Aero Club has a *contractual right* to have its tender considered. He submitted his tender on time. Owner's obligation was to consider all timely and conforming tenders.
(4) City Polytechnic of Hong Kong v. Blue Cross (Asia-Pacific) Insurance (1993) HCA No. A10750	Tenderer who withdrew tender within tender validity period was held liable for damages.
(5) Pratt Contractors Ltd v. Palmerston North City Council (1995) 1 NZLR 469	The court held that there was breach of *tendering contract* when the owner accepted a non-conforming tender.
(6) Hughes Aircraft Systems International *v.* Air Services Australia (1997) 146 ALR 1	This case recognises the existence of a '*bid contract*' or '*process contract*' in tendering situation. It suggests that an owner who has not followed the procedures indicated in the invitation to tender may be liable if compliance with the procedures would have led to a contract with another tenderer.

1. ANALYSIS OF PRATT CONTRACTOR CASE, NEW ZEALAND IN RELATION TO ALTERNATIVE TENDERS

Pratt Contractor Ltd v. Palmerston North City Council (1995) 1 NZLR 469 highlights the problems for owners associated with 'alternative tenders' and the 'tendering contract'. The plaintiff contractor sued the local Council for damages because it did not obtain the contract. Council invited tenders for the construction of a road flyover and the tender form contained the usual clause that the owner was not bound to accept the lowest or any tender. Four conforming tenders were received. Pratt submitted the lowest conforming tender, and on the basis of the tender requirements, expected to be awarded the contract.

One tenderer submitted an alternative tender in addition to its conforming tender. Tendering procedures had contemplated alternative tenders as a means of encouraging innovation but must not alter the scope of the final product. The alternative tender indicated that the saving would be in order of $250,000 and further information could be provided if required. The saving in price offered by the alternative tender was attractive to the Council. After negotiation, the Council accepted the alternative and Pratt commenced proceedings against the Council. The New Zealand High Court held that Pratt can successfully sue for breach of contract due to the following reasons:

a) there was a contractual relationship between the Council and individual tenderer who submitted a conforming tender. The relationship is described as the 'tendering contract'. Council not only had to treat all conforming tenders equally and fairly but had to abide by its own stipulation.

b) the lowest alternative tender was not capable of acceptance because it was lacking certainty of price and it did not meet the specific tender requirements.

c) there was a real danger of unfairness and tender abuse whereby unsuccessful tenderers could reduce their tenders by a sum sufficient to secure the contract by offering a 'saving' derived from a purported alternative bid.

Gallen J said; "Those are all good reasons for insisting upon a precision in definition for alternative tenders, which gives not only the tendering authority adequate means of assessing what is proposed, but also does not disadvantage other tenders who have submitted tenders as requested."

EVALUATION OF ALTERNATIVE TENDERS - WHERE CAN WE GO?

Craig (1997) concluded that in Pratt Contractors, the objection to the Council's tendering process was that the Council did not reject all tenders, but attempted to negotiate with one tenderer on his alternative proposal within the tendering process in contradiction to the tender rules set down by the Council itself. As that alternative was too vague to form a basis for acceptance, he further advised that an 'alternative tender' must be put in terms which are sufficiently precise to be evaluated and accepted by the owner. Likewise, Bailey (1998) stated that so long as the conforming tender was capable of acceptance there is no reason why an agreement could not be reached on the basis of an alternative proposal. In order to avoid a breach of the tendering contract but at the same time allow the innovative proposal a competitive advantage, it has been suggested that tender conditions must define the scope of 'alternative tenders'. That scope must not be too tight so as to restrict innovation but also not be too wide resulting in a proposal which is vastly different from the one originally tendered for.

In actual practice, one can easily notice that the criteria for tender acceptance are not normally included or stipulated in the tendering code or conditions of tendering. Informal interviews have been conducted with some of the clients/owners in South Australia, which show that their tender assessment criteria are always kept confidential and are not normally disclosed to tenderers before acceptance. On the question of alternative tender, the respondents indicated that in general they would look for cost saving, shorter completion time and workability of alternative design proposals.

On a more positive side, the following conditions of tendering for one particular project from the Department of Administrative & Information Services (DAIS, a government agency) in Adelaide, South Australia, serve to illustrate a good practice for alternative tender assessment:

Alternative Proposal Assessment

Unless submitted with a conforming tender, alternative proposals will not be considered.

The assessment of alternatives will be by an assessment panel comprising:

- DAIS risk manager
- Client representative

- Primary consultant, and
- Cost manager

The panel will assess all alternative proposals offered and agree those that will be considered further because they meet the following criteria:
- Sufficient details such that the panel is able to make an assessment without further reference to the tenderer
- Price without qualification
- Efficiency in construction methodology or site establishment and effectiveness in materials, plant and /or finishes selection

The panel will assess the remaining alternative proposals and agree those that will be considered further because they have acceptable impact on the tendered design with regard to:
- Functions
- Aesthetics, and
- Life cycle costs

The panel will assess the remaining alternative proposals and agree those that will be recommended for acceptance because the tendered price adjustment represents value to the Principal. The DAIS risk manager will prepare a revised tender sum to be confirmed in writing by the tenderer.

TENDER VALIDITY PERIOD

Clients are used to putting requirements in their tender documentation on the length of period for which any tender received shall remain open for acceptance. Historic cases such as Routledge v. Grant (1828) 4 Bing 653 had set the principle that an offeror was free to withdraw his offer at any time before acceptance despite the existence of any period stipulated for the offer to remain open. Relying on such precedent, some tenderers find it expedient to submit bids first and check their accuracy later, especially when the tender period is short.

The landmark case of City Polytechnic of Hong Kong v. Blue Cross (Asia-Pacific) Insurance (1993) HCA No. A10750 have changed the law in this respect. The plaintiff, City Polytechnic, asked for tenders for the medical insurance of its staff, with the tender conditions including a requirement that tender should remain open for acceptance for three months. Blue Cross submitted a tender, but later withdrew it before the three months expired. The plaintiff wanted to enforce its tender conditions but the defendant refused, contending that no consideration was moved from the former to obtain the latter's promise of keeping the tender open. City Polytechnic then entered into insurance contract with another party at a higher premium and sued for damages.

The High Court held that consideration was present in the form of an implied undertaking of the Polytechnic to consider Blue Cross' tender along with all other conforming tenders. The Blackpool case was cited and an implied contract was established, whereby Blue Cross agreed to keep its tender open for three months. By withdrawing tender before the expiry of the validity period, Blue Cross committed a breach of the implied contract and City Polytechnic was entitled to damages to reimburse its higher premium cost.

Hence, it can be seen that tender conditions work both ways, similar to a knife with two cutting edges. Clients and tenderers are obliged to follow the conditions, even before the proper contract is formed by offer and acceptance. Yet, since most clients are in control of the drafting of such conditions, they can still take the upper hand by careful wording to their benefits. Tenderers have to pay extra care in reading these conditions and understanding their implications.

IMPLICATIONS FOR THE ASIAN PACIFIC REGION

Since the abovementioned cases have been decided in common law jurisdictions, countries or administrative regions (such as Hong Kong) in the Asian Pacific region practising common law may take the cases as having persuasive effects when similar disputes come to their own courts. Notwithstanding the legal repercussions, some countries in the Asian Pacific arena (for example, New Zealand and Australia) have developed tendering codes aimed at rationalizing tendering practice, notably in dealing with alternative tenders (Craig 1997). From the writers' point of view, DAIS, the government agency in South Australia in dealing with alternative tender evaluation could be a good prototype for consideration. As described before, unless submitted with a conforming tender, alternative proposals should not be considered. In China, with the increasing use of the tendering system in awarding construction contracts, much attention is now being put into establishing ground rules for efficient and equitable tendering practice. On a national level, the Ministry of Construction has promulgated various guidelines and stipulations regulating the management of tenders. On a regional level, provincial governments have also developed rules and bye-laws to cater for the improvement of tendering arrangement. On a promising note, the Hong Kong Special Administrative Region has been using the tendering system for a long time. Therefore, there have been numerous exchange opportunities between Hong Kong and the Mainland for beneficial sharing of experience, in particular with the impacts of those international law cases in tender procurement.

CONCLUSIONS

Since the tendering process is inherently price competitive and based on standard contracts that are framed to accommodate adversarial relationships the adoption of the "tendering contract" concept in court decisions is likely to severely inhibit the opportunity for alternative tenders.

Despite the difficulties, there are good public policy reasons why contract-awarding bodies should consider alternative tenders. They are an important means of ensuring that innovative approaches as to contracts are available to tendering authorities. The public may very well benefit to a considerable degree from the encouragement of such innovation and the availability of cheaper methods of construction than have been contemplated by the tendering authority or their advisers. Therefore careful investigation of the tendering codes or conditions of tendering is therefore needed to clarify the position. The principle to be adhered to is that the owner is obliged to treat all tenders equally and fairly. All conforming tenders must be considered. On the other hand, tenderers should also comply with tender requirements as to the validity period of their tenders. Breach of tendering contract entitles the injured party to the normal remedy of damages.

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APPLYING TRANSACTION COSTING AND RELATIONAL CONTRACTING PRINCIPLES TO IMPROVED RISK MANAGEMENT AND CONTRACTOR SELECTION

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ABSTRACT

Contractor selection and judicious risk management are increasingly crucial to construction clients. Low bid selections and risk-shedding strategies have often led to increased overall costs and soured relationships. Recent procurement trends indicate both growing awareness of the significance of best value based selections and reduced transaction costs, as well as moves towards relational contracting, for example through partnering. A consolidation of relevant observations from two Hong Kong based studies provides a theoretical foundation (through Transactional Costing and Relational Contracting principles) for justifying and promoting both mutually beneficial Joint Risk Management (JRM) and performance-oriented contractor selection strategies.

Keywords: Contractor selection, Relational contracting, Risk management, Transaction cost economics.

INTRODUCTION

It has been observed that most construction clients ('owners') are risk evasive (Ahmed et. al. 1999) and allocate more risks to contractors (Fisk 1997). The former also found that contractors themselves appear willing to take more risks, irrespective of whether they can manage them properly (or not). These attitudes foster two outcomes (Ahmed et. al. 1999 and Fisk 1997): (1) contractors add high contingencies to their bids to cover potential costs of these risks; and (2) many and large construction claims arise and some lead to prolonged disputes. Thus the owners may pay twice for their supposedly transferred risks - firstly within the contingencies component in higher bids and secondly in claims, apart from the indirect costs of disputes. At the same time, contractors may not profit either. They often lose money on delays and disputes (Fisk 1997).

On the other hand, the risk profile is often unique/ project-specific and therefore requires special efforts to manage them. Some of these risks also require the combined efforts of more than one contracting party for effective and efficient containment management. Furthermore, since all possible risks are difficult to foresee at the outset, unforeseen risks would need to be dealt with, using a 'Joint Risk Management' (JRM) strategy that continues into the post-contract stage. For such a joint strategy to work well in the complex, multiparty construction projects of today, conflicts between the diverse participants need to be minimized through better relationships and co-operative teamwork (Dissanayaka and Kumaraswamy 1999). Selection of all key project partners in general, and the contractor(s) in particular, is therefore very important. Major clients as the initiators and main beneficiaries of construction projects have recently pioneered some innovations in contractor selection strategies. They effectively control the contractor selection process, as a part of the overall project procurement system, which includes the 'governance structure'/ contractual form, contract content and project organization.

Recent innovations have also led to a wide variety of procurement options being available for clients. Several researchers such as Skitmore and Marsden (1988), Chan (1995) and Kumaraswamy (1999) have also discussed methodologies for selecting appropriate procurement routes from among the many choices now available to clients and their advisors. Whichever procurement route is selected, contractor selection is one of the prime decision-making tasks that has a significant bearing on ultimate success levels in any construction project. Although "low bid" based choices are still common in public and private clients' contractor selection practices, such purely 'price' based contractor selection decisions may not yield 'best overall economy'. Several researchers, such as Birrell (1988), Russell et al. (1992), Holt et al. (1994), Hatush and Skitmore (1997), Ng and Smith (1998), Alsugair (1999) and Palaneeswaran and Kumaraswamy (2001) have studied various contractor selection practices, identified common criteria for prequalification and bid evaluation and proposed improved methodologies. In addition, Gransberg and Ellicott (1996) and Palaneeswaran et al. (2001) have discussed the delusions of apparent cost savings in purely price based contractor selection.

This paper brings together findings from two Hong Kong-based research projects aimed at identifying (1) improved risk management and (2) better contractor selection strategies. These convergent findings are shown to point to synergistic strategies that will boost both aspects simultaneously. It is also found that Transaction Cost Economics (TCE) and Relational Contracting (RC) concepts provide useful theoretical platforms from which to successfully launch such combined strategies. These theories underpin and justify efforts to (1) rationalize contractor selection and consequent contractual 'transactions' and (2) to improve 'relationships' among project participants and the team-working environment, also with an additional focus on smoother risk management through JRM.

The TCE approach (Williamson 1975, 1979, 1987, 1996) provides a useful framework for analyzing the inevitable differences in interest between the different firms (organizations or parties) who are members of the project coalition (Winch 1989); while RC encourages long term provisions and introduces a degree of flexibility into the contract, by considering a contract to be a relationship among the parties (Macneil 1974, 1978, 1980). RC approaches also appear useful in achieving the overall objective, which as summarized by Walker and Chau (1999) is to reduce the sum of production and transaction costs. This paper aims to integrate these approaches and to provide a conceptual overview of the resultant recommended strategy. This would demonstrate how both RC principles and Transaction Cost optimization approaches may be applied to the contractor selection process in building a successful project team for JRM during the entire project life cycle i.e. at pre-contract, contracting and post-contact stages.

TRANSACTION COST ECONOMICS (TCE)

Fundamentals of TCE

TCE combines economic and sociological perspectives on industrial organizations. The 'transaction' is taken as the basic unit of analysis in the study of economic organization and any problem that can be posed directly or indirectly as a contracting problem is usefully investigated in transaction cost economizing terms (Williamson 1987). The main contention is that, in addition to the production cost, there are also transaction costs (TCs) between parties (Winch 1989). 'A transaction occurs when a good or service is transferred across a technologically separable interface' (Williamson 1987). TCE also considers contracts as 'governance structures', that is, as frameworks for conducting transactions in a changing world. These structures may be of different degrees of formality and flexibility, the optimal choice of which depends on a few key characteristics of the transaction. Meanwhile, the world is viewed to be full of 'opportunistic' individuals (Williamson 1979) who need protecting from each other 'human cunning being such that promises do not guarantee performance'. A parallel concept of

'bounded rationality' (Williamson 1979) that limits capacities for objective decisions, means that a party to a transaction can not plan and monitor a process perfectly because of lack of information.

Transaction Costs (TCs)

TCs in construction include costs of negotiation and writing contingent contracts; costs of monitoring contractual performance; costs of enforcing contractual promises; and costs associated with breaches of contractual promises. In each case these costs may include the costs of acquiring and processing of information, legal costs, organizational costs, and costs associated with inefficient pricing and production behavior (Joskow 1985). In this sense, the main construction contract, while initially a single transaction, usually incorporates a series of subsequent transactions (like claims, variation orders, etc.) because TC also includes the cost of 'effort to identify, explicate and mitigate contractual hazards' (Williamson 1996). Furthermore, the main construction contract in turn gives rise to a second level (and subsequent levels) of transactions for subcontractors, materials, equipment and personnel procurement - where the main contractor is the key player.

Procurement Strategy

Construction projects involve many complex processes, which may often lead to unpredictable outcomes. Complexities of the project, location, type of contract and breakdowns in communication are some of the documented contributors to major risks in construction projects. Evidence from projects worldwide show that these risks are not being adequately dealt with (Thompson and Perry 1992). Many risks are often unique/ project-specific and therefore require special efforts to manage them. This is particularly true of contractual arrangements that need adapting from time to time in the face of uncertainty and complexity, if transient market benefits are to be achieved. Under these conditions, different types of contract are required to support efficient trading relations, where the type of contract is contingent upon the characteristics of the transaction. Thus, before entering into a contract, the 'transactors' (clients/ buyers) first need to precisely determine their requirements and objectives, while being cognizant of both: (1) the nature and characteristics of the proposed transaction(s); and (2) the factors that cause transactional difficulties. Then the 'transactors' need to select the most appropriate project procurement (delivery) systems - including contract types and organizational arrangements (governance structures), risk management and contractor selection strategies - that will minimize total costs.

CONTRACTUAL ASPECTS

'Promisory' and 'Non-promisory' Projections of Contracts

The future in contracts under Restatement (1932, 1973) definition is a 'promise'. It presupposes that a contract is a discrete transaction, and the singular future of contracts is based only on a promise-with-law. On this singular future rests the superstructure of traditional (classical) contract law. Macneil (1974) argued that the world of contract is not a world of discrete transactions so defined; rather it is a world of relations, an ongoing dynamic state, no segment of which - past, present or future - can sensibly be viewed independently from other segments. Furthermore, it is not a world of segmental personal engagements alone, but one tending to engage many aspects of the total personal beings of the participants.

While seeking the nature of both promissory and non-promissory futures of contracts, Macneil (1974) sourced four primal roots of contract and argued that exchange is neither limited to discrete transaction, nor contract to promise (even promise-with-law). But contract is the projection of exchange into the future, a projection emanating from a 'social matrix' that is formed with the other three contract

roots: a 'sense of choice' and an 'awareness of present and future' lead people to constantly do things and to make plans knowing that those actions and plans will affect their future. When the actions and plans relate to 'exchange' (the fourth contract root), a temporal projection of exchange occurs; instead of all elements of all exchange occurring immediately, some, and perhaps all, will fall into place in the future.

Promise is the 'doing of something now', which affects the future by limiting choices, which would otherwise be available to the 'promisor' in the future. It clearly 'individualizes' each of the participants of an exchange as the power of 'human will' affects the future. 'Specificity' is therefore inherent in promise as no one can claim unlimited power to affect the future. Present 'communication' becomes meaningless to the 'promisee' if it is totally lacking specificity. Communication in turn is essential because of the division between the 'promisor' and the 'promisee'. Finally, the separation of selfish "me" and selfish "thee" and the presence of commitment, of specificity and of communication all guarantee that the promise-based exchange-projection will indeed be a measured reciprocity. Thus promise, as a projector of exchange, is "present communication of a commitment to future engagement in a specified reciprocal measured exchange" (Macneil 1974). But the future exchange and other future motivations arising out of dependence on ongoing exchange relations will cause exchange to occur in certain patterns, which are partially predictable and will continue. Such relational expectations, if firmly enough grounded in fact, assure "satisfactory" exchanges in future without need for present specificity, present communication or present measured reciprocity.

Contract Types

Macneil (1974) argued that the world of contracts is not a world of discrete transactions; rather it is a world of relations, in an ongoing dynamic state. Macneil (1974) added that contract transactions and contractual relations are different in that although both involve economic exchange, only the latter include whole person relations, relatively deep and extensive communication through a variety of modes, and significant elements of non-economic personal satisfaction. However, no real life human cooperation will be found entirely transactional and lacking some whole personal relations, some diffuse communication and some non-economic personal satisfaction. Nor will contractual relations be found entirely lacking in transactional discreteness, if such lack of discreteness is indeed humanly possible. Accordingly, Macneil (1978) classified contracts into three types: classical, neoclassical, and relational. Lyons and Mehta (1997) summarized key elements of the three types of contracts as follows:

(1) Classical contracts
- The identities and personal attributes of parties are irrelevant
- Specifies a discrete exchange (or duration)
- Contingencies, and penalties for non-performance are specified
- Written documentation overrules any verbal agreement
- Law courts adjudicate in the event of disagreement (litigation)

(2) Neoclassical contracts
- The identities of parties matter
- Normally specifies a fixed duration (or task to be completed)
- It is accepted that not all contingencies can be specified
- Written documentation provides the status quo point from which to negotiate
- Arbitration procedures are available to deal with disputes

(3) Relational contracts
- The identities and personal attributes of parties are crucial
- Normally indeterminate duration

- Norms of behavior, or shared codes of conduct, inform responses to new developments as they unfold
- Written documentation is treated as a record of what has been agreed
- Norms of behavior, or shared codes of conduct, overrule written documents in settling disputes

Fundamentals of Relational Contracting (RC)

Relational or Relationship Contracting (RC) is a subject that originally attracted attention in legal research in the 1960's in the US (McInnis 2000). RC embraces a wide and flexible range of approaches to managing the client-contractor relationship based on recognition of mutual benefits and win-win scenarios co-operative relationships between client and contractor. Looking behind today's terminology, RC principles can be recognized as underpinning various approaches, such as partnering, alliancing, joint venturing, long term contracting and other collaborative working arrangements. Essentially RC seeks to emphasize points of convergence between the respective interests of client and contractor, and in so doing, parties may well find they have arrived at solutions to areas traditionally characterized by divergence of their interests (Jones 2000).

Macneil (1980) describes contract broadly as 'the relationship among parties, to the process of projecting exchange into the future'. Because not all the events can be 'presentiated' (made or rendered present in place or time; to cause to be perceived or realized at present), as described by Macneil (1978) and as all the information needed can not be 'presentiated' (discerned or perceived) at the time of contracting, mutual planning is required (Campbell 1997). Mutual planning leads the parties to negotiation, because costs of negotiation are less than higher premiums that may otherwise be incorporated in the bids of contractors and also less costly than terminations of contracts. Mutual planning also needs trust and trustworthy behavior (to counteract opportunism) among the partners or project participants.

'Opportunism' is a 'strategic behavior' (Campbell 1997), translating into a behavioral risk of encountering actions that benefit one party at the expense of other(s) (Lyons and Mehta 1997). Two types of trust work as safeguards against this risk: self-interested trust (SIT) and socially oriented trust (SOT). SIT is forward looking in expecting direct rewards from cooperation in the form of continuing business. SOT, on the other hand, is backward looking i.e. based on a history of working relationships and social relations that creates shared values, moral positions and friendships, which discourage opportunism, even when the probability of future trade is low. Such trust can sustain cooperative behavior and the envisaged JRM in the face of unforeseen problems. These observations reconfirm the increased importance of selecting the 'right' contractor with whom clients can establish and maintain such relationships and attain high performance levels in win-win scenarios.

RC approaches thus appear useful in achieving the overall objective, which is to reduce the sum of production and transaction costs (Walker and Chau, 1999). RC offers a cost-effective means of encouraging collectively beneficial (but apparently individually unprofitable) behavior, when transactions are exposed to opportunism, but a fully contingent contract is too costly (if not impossible) to specify. RC is characterized by the subordination of legal requirements and related formal documents, to informal agreements such as verbal promises, or partnering 'charters'. This mode of governance firstly calls upon both parties to recognize the positive gains from maintaining the business relationship, and secondly, for the parties to transcend the anonymity associated with market transactions. Disagreements are then negotiated towards solutions that do not jeopardize the relationship between the contracting parties. Such objectives and approaches also provide an ideal framework for the joint management of risks that can not be foreseen or clearly allocated to one party at the outset, as discussed in the second paragraph of the 'introduction' section in this paper.

Applying RC Principles to promote the desired JRM

Present risk allocation mechanisms on construction projects vary, depending on several client-specific attitudes and project-specific characteristics. For example, Table 1 presents a relevant summary of responses from 66 respondents around the globe to a Hong Kong based survey on an array of risks transferred to Design-Build contractors. A variation in risk allocation perceptions across different contractual regimes is observed from this summary. It may also be noted that design risks being passed on to the same contracting organization in this increasingly popular Design Build scenario (where there is already some in-built JRM) does not reflect the general construction scenario. Table 2, on the other hand, presents a profile of average perceptions on JRM desirability that are extracted from a summary of relevant responses from 47 respondents to a different Hong Kong based survey that focused on risk management in construction projects in general. Here, it is evident that sizable components (percentages) of many of the 41 identified common construction project risks were perceived to be more suited for JRM, despite relatively small divergences between different groups.

This is a very relevant finding, as JRM needs non-adversarial teamwork, where better relations and cooperation among the contracting parties are preconditions. This finding also highlights the potential for (1) future cooperation in post commencement planning and during actual operations, (2) anticipating potential risks/ conflicts through open interactions, (3) resolution of issues including claims through negotiations, and (4) management of residual risks and conflicts through cooperative restorational techniques. All these are in turn expected to lead to cost and time minimization, rationalized risk management, and most issues being resolved within the project without disrupting relationships.

Table 1: Summary of responses on risks transferred to the Design-Builders

Risks that should be transferred to the Design-Builders	Percentage of respondents who ticked 'yes'			
	HK*	USA	OC#	Overall
Ground conditions	61.5	40.6	42.9	45.5
Discovery and relocation of utilities	53.8	68.8	81.0	69.7
Approvals and permits	53.8	71.9	33.3	56.1
Groundwater seepage	53.8	56.3	61.9	57.6
Hazardous wastes/ hazardous working conditions	38.5	37.5	61.9	45.5
Weather conditions	61.5	68.8	52.4	62.1
Variations to satisfy different users'requirements	23.1	43.8	23.8	33.3
Unforeseen environmental requirements	23.1	6.3	19.0	13.6
Acquisition/ possession of construction area	0	31.3	14.3	19.7
Quality control/ quality assurance	46.2	96.9	95.2	86.4
Design criteria	23.1	43.8	38.1	37.9
Design defects from client's initial design	7.7	46.9	42.9	37.9
Constructability of design	69.2	100	76.2	86.4
Co-ordination with other work/ agencies	61.5	93.8	85.7	84.8

* HK - Hong Kong, # OC - Other countries

From the discussions in the foregoing sections, it is evident that an amicable RC environment would encourage co-operation and proactively promote JRM. Furthermore, relating to the previous section, it is also evident that the smoother relationships would considerably lower TCs and enhance overall economic performance.

Table 2: Average Perceptions on Joint Risk Management

Percentage of risk that should be jointly managed	Number of risks that should be jointly managed (out of 41 risks used in the survey) as perceived by each group				
	Total (47)	Academics (10)	Consultants (14)	Contractors (8)	Owners (15)
0	0	0	0	7	1
1 - 10	12	4	15	6	14
11 - 30	23	33	22	22	15
31 - 50	6	4	4	5	9
More than 50				1	2
Total Number:	41	41	41	41	41

Note: Figures in parentheses () are numbers of respondents.

OPTIMIZING GOVERNANCE STRUCTURES AND CONTRACT FORMS

The apparently favored movement towards JRM as reflected in the above observations, requires procurement strategies and contractual arrangements that facilitate such approaches. Williamson (1987) found three technical characteristics to be important in understanding which type of contract is optimal for a particular transaction: asset specificity (or specific investment), frequency and uncertainty. 'Specific investment' describes expenditure on plant and machinery, time or effort that has a reduced value if used for any other purpose (Lyons and Mehta 1997). As regards 'frequency', repeated transactions make it worthwhile to set up special arrangements. As for 'uncertainty', the greater the degree of uncertainty surrounding future requirements, the greater the need for contracts to allow room for adaptation to new arrangements.

On the presumption that uncertainty is present in sufficient degrees to pose an ex post (post-contractual) adaptive, sequential decision requirement (and also that such uncertainty may also generate opportunism, which can be better controlled by choosing an appropriate form of contract), Williamson (1987) focused on degree of specific investment and frequency of transacting. He identified three specific investment classes - non-specific (e.g. purchasing standard equipment, material, etc.), mixed (purchasing customized equipment, material, etc.) and highly specific or idiosyncratic (e.g. constructing a plant); and three frequency classes - one-off, occasional and recurrent. He believed that few transactions had a completely isolated and discrete character. Therefore the difference between one-off and occasional transactions was not important and he considered only occasional and recurrent frequency distinctions. He then formulated an efficient match of governance structures with Macneil's (1978) contractual classification. This is illustrated in Table 3.

Table 3: Optimal Contractual Forms

		Investment characteristics		
		Non-specific	Mixed	Idiosyncratic
Frequency	Occasional	Classical contracting	Neoclassical contracting	Neoclassical contracting
	Recurrent	Classical contracting	Relational contracting	Relational contracting

Source: Williamson (1987, page 79)

If there is no specific investment, there is less incentive for continuity in a business relationship. Therefore it would not matter much if problems were ultimately resolved by court action, or even by the mere threat of litigation. It is thus appropriate for traders to rely on the classical contract to cover the discrete exchange. But if specific investments are at stake, continuity becomes more important.

Under these conditions, the recurrent transaction justifies considerable effort in developing a sustainable relational contract. This is not feasible for a transaction that is to be repeated only occasionally, and where there is a need for access to an arbitration procedure to sort out disputes. Under these conditions, the neoclassical contract is the most appropriate. If idiosyncratic investments and the potential cost of opportunism become very large, then market transactions are likely to become internalized within the firm. The present rethinking of contractor selection strategies (aimed at enhanced overall performance) provides fertile ground to plant the forgoing seeds of innovative (and more 'relational') contractual forms based on longer-term relationships.

LINKING TO IMPROVED CONTRACTOR SELECTION STRATEGIES

In general, the direct transaction costs (TCs) of contractor selection include procurement related costs such as the administration of registered lists of contractors, short listing or prequalification exercise costs, advertisement costs, tender preparation, issue and evaluation, as well as contract finalization costs. TCs of the contract extend further, to the co-ordination, contracts administration, measurement, monitoring, information collection, supervision and quality control and these would be clearly dependent on the type of contractor selected. Life cycle costs (such as in facility operation, maintenance, repair/ replacement expenses) are also now considered in some 'best value' based good procurement practices. However, several intangible/ hidden costs also arise from technical and economic under-performance, claims processing and dispute resolution, and rework and rectification for example. In this context, contractor selection strategies should be re-examined from a TCE perspective. The total costs of procurement should be clearly taken to include both production costs (e.g. construction contract arrangements and related expenses) and TCs (e.g. as indicated above). This longer term and broader perspective provides a solid basis and strong justification for departing from the tyranny of purely tender-priced selections that has dominated public sector tender evaluation boards and distorted procurement strategies in general.

Palaneeswaran and Kumaraswamy (2000) studied present contractor selection methods including some innovative initiatives, identified 'best practices' and proposed a benchmarking model for public clients that should lead to further improvements. Many such best practices aim at overall economic savings and benefits for all (transaction partners) as well as harmonious relationships among them, which in turn reduce TCs further. The following are examples of some such potentially beneficial best practices:

- Well structured continuous contractor performance assessment practices, which were primarily designed for controlling quality and regulating/ minimizing contractor non-performance, can also be proactively mobilized as a motivation tool for contractor performance. For instance, the Hong Kong Housing Authority (HKHA) has established a 'PASS' (Performance Assessment Scoring System) system for contractor performance evaluation, on the basis of which well performing contractors are provided with more tendering opportunities. Furthermore, the HKHA recently formulated a 'Preferential Tender Score' system in which the contractor performance scores are incorporated in tender evaluations. This explicit and definitive incorporation of potential performance factors reflects recognition of the importance of reducing overall TCs, and of encouraging a longer-term relational perspective.
- In general, transparency in contractor selections boosts confidence and trust, from a 'relational' viewpoint. Furthermore, it could well enhance the competitiveness and overall performance levels. In this context, several clients including Works Departments under the Hong Kong Works Bureau now follow the World Trade Organization (WTO) regulations on transparent selection procedures.
- Life cycle cost bidding is a procurement system, which incorporates life cycle costs in competitive bids. Life cycle cost analysis is used in evaluating alternatives. For example, Missouri Department of Transportation used a 35-year design life for cost analysis purposes (MDT, 1998).

'Partnering' is a good example of an RC approach that has reduced TCs and improved performance levels by focusing on mutual objectives, early problem resolution at the lowest possible level, trust and co-operation (ECI 1997). Partnering 'lubricates' communication flows and counteracts the suspicious and non-trusting attitudes between the transactors that had been inculcated through previously adversarial contractual arrangements. The revamped working arrangements on a 'partnered' project also lay foundations for long-term relationships and mutual trust among the various project stakeholders that could facilitate future RC and reduce overall TCs.

Some clients, such as the Utah Department of Transportation, USA may even insist on 'partnering' as a mandatory precondition for contractor prequalification (UDT, 1997). The Hong Kong Hospital Authority mobilized benefits from partnering in some hospital projects (Dissanayaka and Kumaraswamy, 1999), while the Mass Transit Railway Corporation (MTRC) in Hong Kong has injected a partnering philosophy into its Tseung Kwan O Extension project (Bayliss, 2000). In this context, it may also be noted that the MTRC has an anecdotal reputation for achieving good relationships with contractors, hence minimizing disputes and associated TCs through such 'relational' approaches.

The high levels of sub-contracting in construction contracts point to the importance of integrating sub-contractors in RC frameworks in general and including them in 'partnering' in particular (Dissanayaka and Kumaraswamy, 1999). In this context, it has been found that subcontractor tender pricing levels on a pilot project in the U.K. were reduced by about 10% on account of anticipated efficiencies (reduced TCs) arising from partnering. Time and cost control and relationships were all found to have improved considerably on this project (Kumaraswamy and Mathews, 2000).

CONCLUSIONS

There is evidence of a growing appreciation of benefits from JRM through more 'relational' and less adversarial contracting frameworks; and of more performance-oriented contractor selection strategies. However, many clients (specially in the public sector) and their advisers have difficulties in justifying apparent risks in deviating from traditionally rigid risk allocation, adversarial contracting and low-bid contractor selection modalities. By revisiting the not-so-new TCE and RC theories, and by adapting and applying them to current needs, this paper presents a theoretical framework (with practical examples) within which these enlightened approaches can be justified and developed.

For example, the trust, smoother communications and faster problem solving achieved through 'partnering' considerably boosts transactional efficiencies and lays firm foundations for mutually beneficial longer-term relationships. The latter would in turn also feature in contractor selection scenarios in terms of 'factoring in' relative potential performance levels from different tenderers/ potential partners during tender evaluation, as in the example on selecting sub-contractors listed in the last section. Jointly targeted overall common objectives, such as reduced total costs and time, enhanced quality and safety levels, reduced disputes and longer-term productive relationships can then well lead to the envisaged win-win scenarios.

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CONTROLLING FAILURE-COSTS IN EMERGING MARKETS : IMPROVING PROCESSES WITHOUT A HIT-AND-RUN-APPROACH

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ABSTRACT

A growing need for improvement and rationalization of the construction process exists in the present globalizing construction industry. This is particularly so in several EU-countries. On the one hand this need is inspired by the fact that present construction industry in several areas is suffering from economic diseases but, onthe other hand, it also has its roots in the emergence of poor quality-levels, decreasing productivitiy, etc. As a result, several major participants in the field seek to cut their failure-costs (which are costs related to aspects which disturb a smooth construction-process, leading to too high construction-costs). Besides that atmosphere of cutting costs in a shrinking market, there is also another phenomon: The need for cutting failure-costs in a growing market! When a market is getting 'overheated', the need for speeding-up the processis emphasised, as clients do not want to wait long for their projects. This pressurizes the parties to pay more attention to daily processes. So, these devclopments lead to just solving problems on the site (e.g. 'hit-and-run') instead of avoiding them through reliable work-preparation! Especially in the field of cost-data this attitude is essential. The use of actual cost-data of 'own' completed projects is one of the main tools for competitive power. That needs reduction of failure-costs and its negative impact on construction-costs, leading to a reliable own cost-price of new projects. Many parties in the construction-market do not even know their actual cost, introducing thereby undefined failures (risks! = costs!) in their projects. Although this can result into a low price for clients (with which quality-level?), at the end a too low price is not in the interest of both parties involved: The client gets a too low quality-level, or the contractor goes bankrupt. So keeping the balance, really improving the cost-knowledge based on recent data, benefiys all the parties involved. That requires serious attention, not just going for a 'hit-and-run-approach'!

Keywords: Construction, Emerging markets, Failure-costs, Rationalization, Work-Preparation.

INTRODUCTION

In present economies it seems that borders are diminishing. This is not only the case for technology-borders and financial borders like e.g. knowledge-exchange and money-transfer, but also for the geographical borders: When looking to e.g. the European Community (EC), the diminishing of internal geographical borders is real, leading to a large common European market-place: A market-place regulated by several common laws and regulations, like e.g. the European Directives on Procurement

[EC, 1993]. Its area is still growing, with several Mid-European countries are selected to become members of the EC within the coming five years.

So, the market seems to become a more dynamic one, leading to a lot of (globalizing) activities but still with a regional orientation. Specific for the European region, some signals of 'increasing transparency and activity in European occupational and investment markets' can be seen [FDPSavills, 1999; Estate Scandinavia, 1999], which creates growing opportunities for developing business in (inter)national construction industry.

CONSTRUCTION IN A GROWING MARKET

The product: real-estate

The growth of developing business in construction can also be seen outside the EC. As becomes clear from an overview of projects currently under development and/or construction, presented at the latest MIPIM-exhibition in Cannes - France, the spread of projects worldwide is obvious. Also China was considereded there, where a growing number of projects are in a development-stage or under construction [ODEB, 2000]. Although it seems that construction in China is growing or even 'booming', there are also countries which have a decreasing number of construction activities.

In general this means that a shift and transfer of investments around the world is going on, searching for the best places to invest in. In relation to that shift, it seems that in real-estate the scope of the investors is moving more from long-term to short-term, regardless the (technical) trend for life-cycle thinking in real-estate. However, one should stay realistic, while a lot of increasing activities in construction developments are a result of just a shift of activities instead of (internal) growth: When looking globally, the growth is a result of changes in different regions, caused by shifts of investment-flows around the world. These aspects make construction industry a 'thermometer' of local and global economies.

The process: construction-industry

As the construction-industry and its parties (contractors, developers and engineers) are a main source of production-processes for building real-estate, the growth and/or shift of real-estate investments influences the position of the construction-market and its players: Several parties join together and/or merge by buying or exchanging shares and/or stocks, often resulting in specialization or diversification in business-activities. Especially how to canalize these investment-flows still is an important issue; some West-European construction companies are active internationally in recently developed markets like the former East-German and Middle-European areas. Activities are generated by, e.g., buying participation in local companies [Tijhuis, 1998].

Some opportunities and threats

Being active in growing markets is interesting for the shareholders of the company. The following opportunities are e.g. important within that scope:

- Exposure:
  Especially in construction-industry it can result into more exposure to possible investors, which is a positive signal for eventually stock-listed companies.
- Networks:
  Not only for the company itself, but also and especially for possible stakeholders of projects, existing networks can be of great advantage in creating partnerships: When e.g. a contractor has several

branches and networks abroad, the partnership (and its partners!) can also expand activities and market-shares.

There are also specific threats. As an example, the case of a big Dutch company working abroad for a German client some years ago [e.g. Voorn, 1995]:

> The company was building the new governmental buildings for the national German government. Due to heavy rainfall the river Rhine flooded, and set the completed cellars under water. This caused an enormous damage of more than 100 million Euro. And insurance-companies did not want to pay, while they blamed the company for not knowing the regulations, etc. But that was not the only thing: The claim the client (government) put on the company was so big, that the stock-price of the company decreased very quickly; Shareholders got afraid. Although the claim-procedure still is not finished, the company since suffers from quite an undervaluation of their share-price.

Problems like those illustrated above can occur when the opportunities do work out succesfully (e.g. project-mistakes in a high-exposure company can cause a 'marketing-disaster'; or working within 'wrong' networks can influence the integrity of the company).

However, growing markets often do pose specific threats, notably:

- Culture:
  This issue is especially obvious when working within specific attitudes of local networks. As became clear during a CIB-TG23 workshop, the 'culture-issue' should surely become part of the deal [Tijhuis, 2001]. Therefore, thinking globally together with working local is important, often leading to a 'glocalizing' business.
- Failure-costs:
  In a growing market, the need for faster construction-processes is acute. This often results in a lack of time for good preparation, also leading to e.g. a lack of knowledge of own construction-costs: Contractors often do not know the negative impact of failure-costs (which are costs related to aspects which disturb a smooth construction-process, leading to inflated construction-costs) on the actual construction-costs. People mainly focus on solving actual, day-to-day problems 'on the site', not having time for good work-preparation, cost-engineering, etc. 'in the office' which should improve the competitive power of the company. Such a 'hit-and-run-approach' is one of the main reasons for the fact that contractors are very difficult to convince to prepare their projects well,in order to reduce the negative impact failure-costs. Not only is such preparation important in a decreasing market, but even more so in a growing market.

Some examples of failure-costs are:

- Wrong dimensions of (prefabricated) building elements; especially concrete-elements often have deviations, causing fixing-problems on the site. It takes time to repair or renew them, leading to several additional costs.
- Delivery of building materials in the wrong sequence, not following the 'just-in-time' principle. It often occurs that the wrong materials are at the site, or even are not at all on the site. Time for waiting, extra logistics, etc. causes split working-hours, extra travelling and transportion, etc.
- Rushing and 'speedy' engineering activities increases the risk of unforeseen failures in designs, etc. Although they can be repaired when discovered (often too late, e.g. on the site!) it costs money. Even worse, when such failures are not discovered at all: yielding hidden failures in the completed project, leading to risks during the use (and introducing costs...!).
- The need for reducing the construction time often leads to the use of prefabrication. Such activities must be examined carefully: If not planned adequately, prefabrication, through fialures, tensd to cause a lot of repetitive works, and, potentially, a high risk of repetition of failures and consequent costs. Thorough work-preparation is needed, but that takes time!

In the following part of this paper failure-costs and their implications are examined more closely.

FAILURE-COSTS AND WORK-PREPARATION

The role of quality-systems

Awareness of the risk of failure-costs and their negative impact on the construction-costs is a very important issue. This may seem logical but, in several construction-companies, the management and employees are pushing this issue aside as long as there are profits being made. So, they do not consider that if profits being made, they could have been better!

The reaction such companies often give, is to point 'proudly' to their in-house quality-systems. Although having such quality-systems is necessary, they are no guarantee for improving profit or reducing failure-costs. Besides that, it often occurs that the parties involved in projects each have their own systems (a 'vertical' approach), not covered by a connecting project-quality-system (a 'horizontal' approach). As Tijhuis and Lousberg pointed out, the connecting systems play an important role in the project [Tijhuis & Lousberg, 2000]. Figure 1 represents this approach schematically.

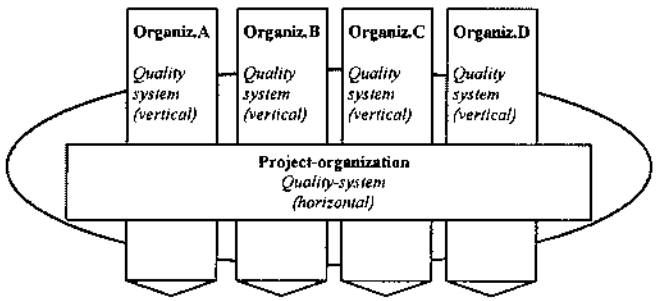

Figure 1 Quality management at organization level ('vertical') and project level ('horizontal') [Tijhuis & Lousberg, 2000]

The role of the 'pig's cycle' in a growing construction industry

Growing markets, also in construction and real-estate, have some common aspects, which can be compared with the so-called 'pig's cycle' from economic models:

- When the market is growing, the number of projects is growing (compare: the growing demand for pig's meat);
- A growing market attracts a lot of contractors, being interested to work in the real-estate-market, even taking risk for development (compare: everyone wants to breed pigs, and setting-up facilities for it);
- It takes time to complete projects and, at the moment of finishing, there are a lot of projects (compare: breeding pigs takes time, but when they are grown, at once a lot of them are crowding the market);
- As the demand declines, a lot of projects are attending less interested clients, resulting in a decrease of the price (compare: the people can choose from a number of suppliers, so price of pig's meat is decreasing);
- New developers/contractors can buy quite cheap project/development-sites, to re-start and take change at a lower price-level, but with a better preparation-possibility, delivering quality and being succesfull (compare: New breeders for pigs can enter the market, buying the suffering breeders which entered the market during the 'first boom').

The described cycle was e.g. the case in the opened market of the former East-German areas during the 'first boom', just after the break-down of the Berlin Wall [Der Spiegel, 1995]. The following case illustrates the cycle [KPMG, 1992]:

> The German government wanted to stimulate investments in the former East-German areas. By issuing regulations, creating special financial (tax)facilities for investors into real estate

and e.g. machinery), they pulled an enormous flood of private capital into those areas. But as procedures still took time, and e.g. the ownership of land still was not quite clear, the planned projects were realized very slowly. That often meant a too long time-to-market. And when a lot of projects were completed more or less in the same period, the market demand decreased already, while parties got 'back to reality' again. This led to lowering prices for the projects, which had been planned to come on a growing market. But when it pointed out it was just the opposite, downside, trend, a lot of developers and contractors went bankrupt.

Nowadays, when the market-sentiment has come to sub-normal proportions again, there still is activity in certain areaqs. But not with that overheated sentiment: 'Reality is back again'.

In Figure 2 this 'pig's cycle' in construction is represented schematically with its opportunities and threats.

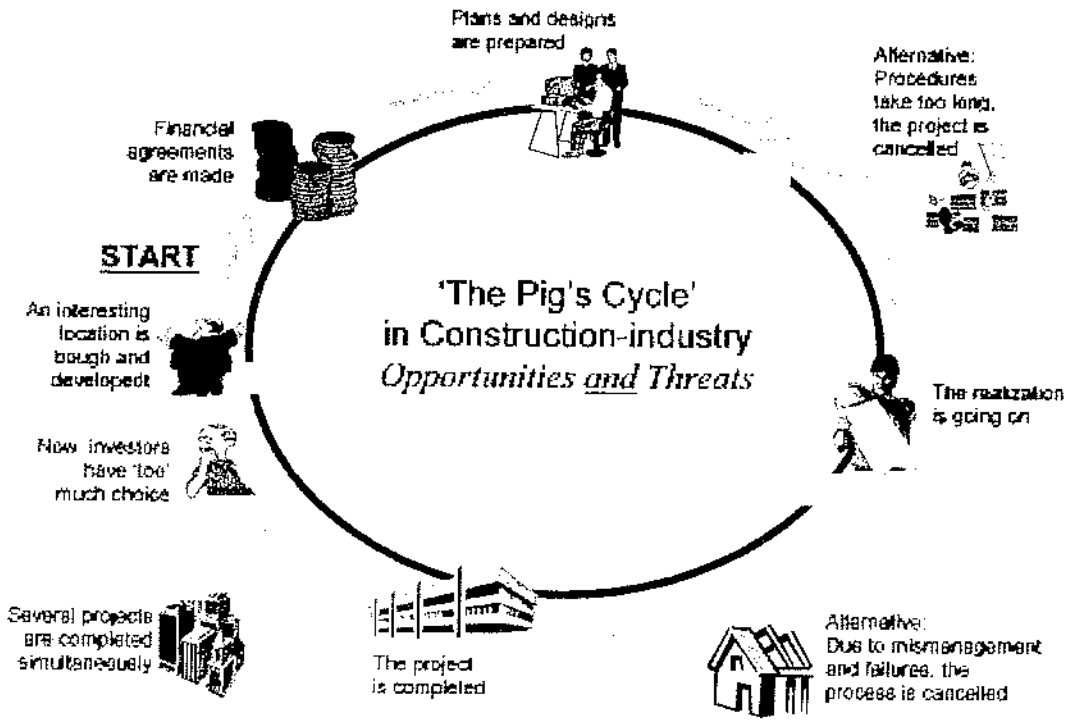

Figure 2 The 'pig's cycle' in construction, representing opportunities and threats

What can construction industry in a growing construction-marke learn from the above described 'pig's cycle'? In general, to be succesfull in the market, one should be carefull for especially the following aspects:

When thinking and acting 'cyclically':

- Only look for the best locations, these places will attract people in a decreasing market also. This requires, in general, a higher investment as the sites are more expensive;
- Be as quick as possible in the market, especially with a smooth process. In construction-process that means extra risks, while one needs enough time to prepare projects well; the situation is compounded by a lot of regulations and prcedures which are complex and retard the process;

Especially the issues of the need for good work-preparation and the retarding of processes are important. Both can cause increases of failure-costs and a too long 'time-to-market'; regulations are influenced by governmental policy and tend to increase the risk for the developer/contractor. Besides these aspects, there is the fact that, for new parties, the barriers for entering the construction industry

are very low. This means e.g. that in a growing as well as shrinking market the risk of decreasing profits is highly significant, due to an increase of competition.

When thinking and acting 'anti-cyclically':

- Only look for the second or even third-best locations, while these places will be cheaper, and can still be interesting in a decreasing market;
- Wait before entering the market, while the market should be first settling itself down and get balanced. Not only on the demand/supply-side, but also an the regulation- and governmental procedures side.

When entering a market after a 'first boom' there are, in general, several strategies to take, e.g.:

(1) Taking-over a suffering 'hit-and-run' company (which e.g. entered the market during the 'first boom'), but which failed to complete projects successfully.

(2) Be prepared and rationalized on the moment of entering a market, to deliver a high performance process and project, resulting as a reliable partner for clients.

Especially the last issues should beemphasised. Not in a 'fuzzy' way of controlling risk and/or construction costs [Moselhi, 1995], but very strongly focussing on structurized organization of the process, including a thorough knowledge of the own construction-costs, leading to a reduction of failure-costs.

Although good preparation of the work takes time, it isworth pursuing: Not only because the contractor can be satisfied by creating better and rationalized construction-processes [Tijhuis, 1999], but also because it should lead to satisfaction of the important party in construction industry: The client!

CONCLUSIONS AND RECOMMENDATIONS

1 The growth of the construction industry is a result of shifting capital on a global scale, following and resulting in real estate developments. This makes it even more important to be aware of a cyclic process of growth and decline of construction, which can be regarded as the thermometer of the local and the global economies.

2 As construction has low barriers for new parties to enter, there is a continuous threat of increasing competition, leading to a decrease in profits - the process operates in a growing as well as in a shrinking market.

3 Being first in a growing market has opportunities for being the best, but only when having 'full-speed' potention. Especially this dependance on 'speed' makes the construction industry (in such growing markets) a risky one. There are several external parties and procedures which influence this speed, reducing the 'time to market', thus increasing the risk of e.g. developments.

4 Entering a market after a 'first boom' can still give good opportunities: Being prepared better, buying for realistic prices, and last but not least, having better structured construction-processes (when calculating risks, construction-costs, etc.) to reduce failure-costs and its negative impact on construction-costs.

5 Do not let the market push away the common sense and reality of construction (as part of the negative way of the 'pig's cycle'). Be serious in the work preparation, taking the time and learning to know and thus to avoid the possible failiure costs of the company or project.

6 The need for reducing the construction time often leads to the use of prefabrication concepts. Especially prefabrication activities must be scrutinised. They often mean a lot of repetitive elements and works, causing also a lot of risk for repetition of failures and failure-costs. A thorough work-preparation is therefore needed.

These conclusions and recommendations will foster realistic projects in the market, improving their profit by improving their processes and products; not with a hit-and-run-approach, but within a long-term scope, leading to both satisfied contractors and clients.

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A PERSPECTIVE ON CONSTRUCTION MANAGEMENT AND ECONOMICS ISSUES IN WESTERN AND CHINESE CONSTRUCTION INDUSTRIES

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ABSTRACT

The paper takes as its theme, the dominant message from market economies such as the United Kingdom and Australia that the key role of the government client is in activating a cultural shift in the industry through the strengthening and improvement of management practices. In Western economies this has lead to the adoption of management techniques such as benchmarking, total quality management, constructability, value management, partnering and reengineering . The counterpoint in China has been the introduction of initiatives such as the Tangible Construction Market (TCM).

This paper presents a personal view of the current situation in which the burgeoning number of Western management concepts is seen to be a potential problem. The growth of Facilities Management and the changing relationships of the design and construction professions with the client is charted using the Pareto influence curve.

The paper suggests that that unpredictable social, economic, technical and political aspects of a globalising society will force organisations to look at forming national and trans-national business alliances. The proposition is made that project alliancing is one management practice which will become increasing popular in the coming decade.

The paper concludes by expressing the view that increased dialogue between Western and Chinese construction industries is essential for the common good and, that both systems have much to gain and learn from each other.

Keywords: systems theory, Pareto cost influence curve, Tangible Construction Market (TCM), Facilities Management (FM), project alliancing.

INTRODUCTION

The genesis for this paper comes partly from the respective professional backgrounds of the two authors and also from collaborative work which the authors are currently undertaking with colleagues in the Ministries of Supervision and Construction in China.

In our view there has been a tendency to assume that because China is in a transitional stage from a planned economy to a market economy that China should accelerate the change-over process by adopting modern Western management concepts. This may not necessarily be the case.

It is perhaps worthwhile emphasising the point, that in Western society there is no single unified approach to management in general or construction management in particular. For example,

when UK professionals tried to use the US system of value engineering they found that they couldn't make it work. The reasons for this were numerous but largely related to the original objectives of the value engineering studies (McGeorge and Palmer 1997). The US system of value engineering was born out of a need for greater accountability on government projects. (Almost all value engineering activity in the US is government work.) The situation in the UK was very different. The UK quantity surveying system (cost control system) provided all the accountability that was needed. Value engineering was required to provide a platform for the examination of value as opposed to cost. This is an illustration of how cultural differences between Western countries has lead to different approaches to the same management concept.

Differences also exist between the US approach to reengineering and the European approach. The Europeans generally finding the approach of Hammer and Champy much too aggressive for European acceptance (Holtham 1994). The head of Siemens, Heirich von Pierer, writing on Business Process Reengineering (BPR) has been quoted to the effect that 'I don't feel completely comfortable with the radical thesis of Mr. Hammer. Our employees are not neutrons, but people. That's why dialogue is important.' Holtham goes on to express the view that BPR needs to be rooted in distinctive European managerial features, in terms of the 'acceptance of the humanistic and holistic stream in European thought, in contrast to the more mechanistic and fragmented US approach with the promotion of the concept of collaboration, between levels in the organisation, across organisations, between supplier and customer, and also across national boundaries. There would appear to be little variance between Holtham's vision of BPR in Europe and Hammer's description of the application of BPR in the United States. Perhaps it is more a disagreement on the method of delivery than the message being delivered. As Holtham concludes, ' The core elements of BPR have value beyond the evangelical North American approach, and BPR has value for Europe, if it is set in a European context'.

Cowan, one of the principal architects of the modern partnering movement stresses that 'Partnering is more than a set of goals and procedures; it is a state a mind, a philosophy. Partnering represents a commitment of respect, trust, co-operation, and excellence for all stakeholders in both partners' organisations' (Cowan et al 1992). Despite the fact that partnering, has been highly successful in the US Australia and the UK it has not gained acceptance in Japanese construction industry where its general philosophy is deemed to be so much a part of Japanese business culture that partnering as a business process is, in effect, redundant.

Whilst on one hand making the argument that some Western construction management concepts may not be appropriate to the Chinese construction industry culture, we are not trying to make the case that there is no opportunity for cross fertilisation between Western and Chinese cultures. When we were first introduced to the Tangible Construction Market TCM[1] we were fascinated by the novel approach which China had taken in tackling a long-standing problem of administrative accountability. The TCM is an interesting phenomenon. It is so named because it is just that - a transparent, auditable process conducted in a tangible - physical - location where all of the officials and construction industry representatives come together to conduct the public bidding process. The word 'tangible' is used to clearly distinguish the new process from previous practices of awarding construction contracts behind closed doors or otherwise in secret - an 'intangible' market. It would appear that the approach taken in establishing the TCM is very much in line with the reengineering concept as advocated by Hammer (1990) that Overtime, corporations have developed elaborate ways to process work. Nobody has ever stepped back and taken a look at the entire system... the imperative for reengineering is to achieve a quantum leap forward rather than small continuous gains. We believe that the TCM has captured the spirit of reengineering by achieving 'discontinuous improvement' and is an example of how Western reengineering principles can cross a cultural divide. Indeed it could be argued that the TCM approach to tendering is a model which might be usefully deployed in any market driven economy.

CULTURAL TRENDS

Having made the argument that there is no world-view of construction management or construction economics, there does however seem to be a universal trend in terms of greater stakeholder involvement in the procurement process. (By procurement, we mean the complete building cycle from the inception stage of a building project to the completion stage when the building is ready for occupation).

The dominant message from market economies such as the United Kingdom and Australia (Latham 1994 and Gyles 1992) is the key role of the client in activating a cultural shift in the industry through the adoption of modern management concepts. This is summarised by Latham who states that 'implementation begins with clients. Clients are at the core of the process and their needs must be met by industry'. Latham then goes on to recommend that 'Government should commit itself to being a best practice client. It should provide its staff with the training necessary to achieve this and establish benchmarking arrangements to provide pressure for continuing improvements in performance.' This has been expressed more succinctly if more crudely, as ' the client having the power of the cheque book'. The emphasis on greater client involvement is closely parallel in the Chinese construction industry by the 1993 Chinese Ministry of Construction (MOC) planning outline for the construction market (see footnote to TCM).

Generally, it would appear, that Government clients are taking on board the directives of Latham, Gyles and the MOC and are now committed to continuous improvement through the strengthening of the management of the construction industry. Whilst this initiative is to be applauded there is still however a good deal of ambiguity about how this might be achieved. There are probably several reasons why this is so. One reason may lie in the fact that many, if not all of the current management concepts are philosophically grounded, if not in systems theory, then at least in a holistic approach. We would contend that this common parentage has given rise to difficulties in terms of identifying concepts as individual branches of the same family tree. This lack of differentiation between current concepts is typified in comments such as 'Constructability is not just value engineering or value management' or 'is reengineering replacing total quality? or more confusingly, 'As partnering is to the project, total quality management is to the construction company' (McGeorge and Palmer 1997).

CURRENT ISSUES

The culture of the construction industry in Western has changed significantly in the last decade. The traditional culture of adversarial relationships is changing and major Government clients have recognised that a commitment to best practice is the way to developing good long term relationships.

Australian State Government Authorities such as the New South Wales Department of Public Works and Services (DPWS) actively promote best practice through the use of contractor pre-qualification schemes using prequalification criteria.

The DPWS contractor accreditation scheme (DPWS 1995) lists the following construction industry best practice initiatives:

1. Commitment to client satisfaction
2. Quality management
3. Occupational health and safety and rehabilitation management
4. Co-operative contracting
5. Workplace reform
6. Management of environmental issues
7. Partnering
8. Benchmarking
9. Another area of best practice nominated by the contractor and accepted by DPWS.

For contracts valued over Aus. $20M contractors must have a demonstrated record of commitment to, or a corporate program for the early implementation of criteria 1 to 6 and at least one of the reform initiatives 7 to 9. Under the scheme, contractors who achieve best practice accreditation will be offered significantly more tendering opportunities than those contractors who are not accredited. It is anticipated that ultimately, only those contractors accredited under the scheme will be eligible for selection to tender for contracts valued at over Aus. $500,000 (a good example of the power of the cheque book in a market economy.)

The DPWS example is given, not by way of promoting DPWS, but by way of illustrating the central theme of this paper that clients are taking on board the introduction of modern management concepts and are applying pressure to the construction industry to accelerate their adoption. They are doing so either explicitly by the use, for example, of formal reengineering principles or implicitly, as in the case of China, in the adoption of a radical approach to tendering in the form of the TCM. In the decade of the 80's the practising construction manager, or the construction management undergraduate would not have heard of concepts such as value management; total quality management; buildability/ constructability; benchmarking; partnering and reengineering. In the 90's there was a greater awareness of these concepts, and clients, particularly government agencies pushed hard for their adoption. However, there is also a good deal of ambiguity about the nature and usefulness of the concepts (McGeorge & Palmer 1997, Fong 1996).

As previously stated one reason may lie in the fact that most of these modern management concepts are philosophically grounded, if not in systems theory, then at least in a holistic approach which encourages increasing stakeholder involvement.

For many years critics of the construction industry have dwelt on the perceived problems of fragmentation and compartmentalisation. Many of the ills which have beset the industry have been blamed on the inability of the industry to see the big picture. Many of the advocates of the techniques that 'their' concept rectifies this. For example Hellard (1995) advocates that 'Partnering will certainly be the key to the holistic approach which must first be brought to the organisation and then incorporated into the team performance with other sub-contractors and the main contractor.' We find no fault with these sentiments, however most of the other current construction management concepts would also subscribe to similar sentiments. The result of this convergence of ideals is that many construction management concepts appear to be in competition with one another for the attention of the same decision-makers.

This can be illustrated by reference to the 'cost influence curve' (based on the Pareto Principle) which has been used extensively in construction management literature. The Pareto principle proposes that the earlier that an individual or group is involved in the decision making process, the greater the potential for impact on the project outcome. Conversely the ability to influence the project outcome diminishes exponentially over time. . The problem which we identify is the conflict which can arise when a large number of concepts compete with one another for the prime position at the origin of the x,y axis.

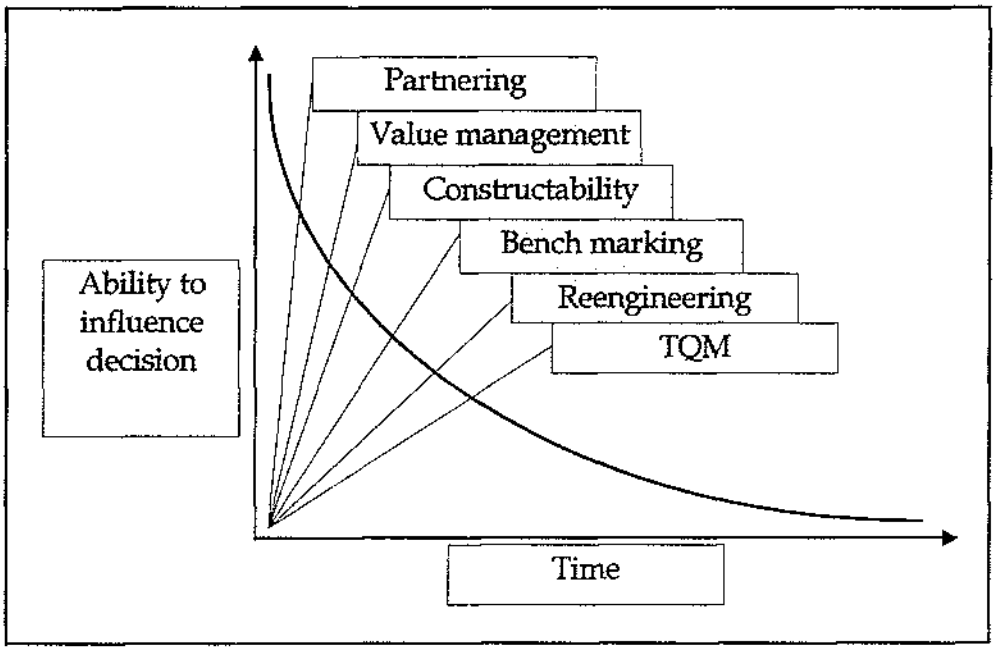

Figure 1 Conflicting demands at origin of the cost influence curve

The argument could be made that although government agencies are encouraging and, in some cases, attempting to enforce their adoption of the concepts, no guidance is being given on how the concepts should be applied concurrently and/or in combination.

Rather surprisingly despite arguing that most modern management concepts are underpinned by systems theory, this has not resulted in a unification of the concepts, rather the opposite. The problem lies however, not so much with systems theory, but in the way that it has been applied.

Many researchers in the field of construction management have advocated a systems approach. For example Kelly and Male (1993) recommend the use of systems theory and systems thinking in the field of value management as do Chen and McGeorge (1993) in the development of a constructability model. It can also be demonstrated that the systems approach underpins reengineering . Checkland (1981) however wryly comments for some years now a systems approach has been a modish phrase. Few are prepared publicly to proclaim that they do not adopt it in their work and it would be an unwise author of a management science text who failed to sub-title his book: 'a systems approach'. There is much ambiguity about what the systems approach actually is. Often a systems approach is taken to simply imply a holistic view. Checkland observes however that 'the systems paradigm is concerned with wholes and their properties. It is holistic, but not in the usual vulgar sense of taking in the whole; systems concepts are concerned with wholes and their hierarchical arrangement rather than the whole.' The interest for us lies in the notion of hierarchical relationships of concepts.

Although it is evident that certain aspects of concepts such as reengineering and partnering have a certain commonality of purpose, this does not necessarily mean that they are amenable to pigeon holing into some form of hierarchical arrangement. By way of example, both reengineering and partnering have to do with cultural change, (Coulson-Thomas 1994, Kelada 1994 and Hellard 1995) with the breaking down of existing barriers, with the creation of different sets of relationships and lines of communications. In theory, at least, the concepts are not mutually exclusive and it is possible that reengineering could take place in a partnering environment or that partnering relationships could result from the implementation of reengineering. The relationship is however complex and is likely to be non-hierarchical. Since partnering could be 'nested' inside reengineering or vice versa. If we then start to add successive overlays of concepts such as constructability and total quality management, then, whilst none of are necessarily mutually

exclusive, a conceptual model of the inter-relationships become increasingly complex as successive concepts are added.

There is an intriguing universality about this set of relationships which, as we have previously stated, crosses cultural divides.

EMERGING ISSUES

The Pareto concept can also be extended to illustrate the increasing influence of the client in the procurement process and how this is making a fundamental impact on the structure of both the Western and Chinese construction industries.

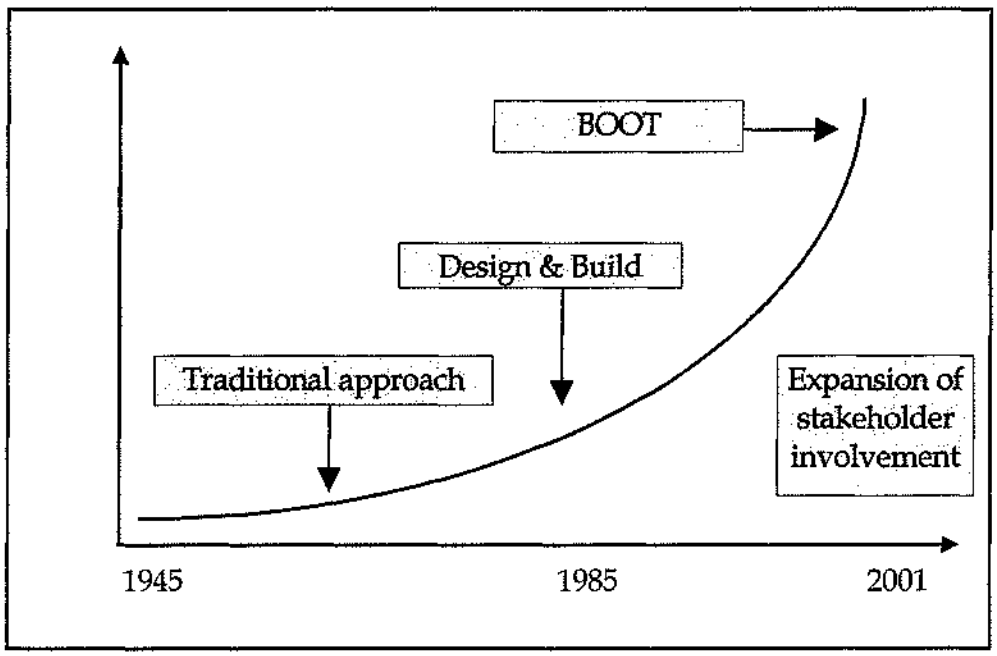

Figure 2 Exponential increase in stakeholders' involvement in procurement process

Figure 2 shows different contractual relationships superimposed on the Pareto influence curve, and demonstrates how contractual arrangements and nature of the procurement process has changed over time in response to increasing client demands and increasing stakeholder involvement.

The era from the end of the second world war until the mid-eighties could perhaps be described as the halcyon years for the architect as leader of the traditional procurement process, operating as the leader of the design team with the contractor's involvement being restricted to the post tender process. The mid-eighties and early nineties saw the emergence of the package type process with the advent of design and build, where government clients, in particular were attracted by the risk allocation opportunities of design and build. The nineties heralded the emergence BOOT with its strong emphasis on stakeholder involvement and full client and contractor participation in the project outcome.

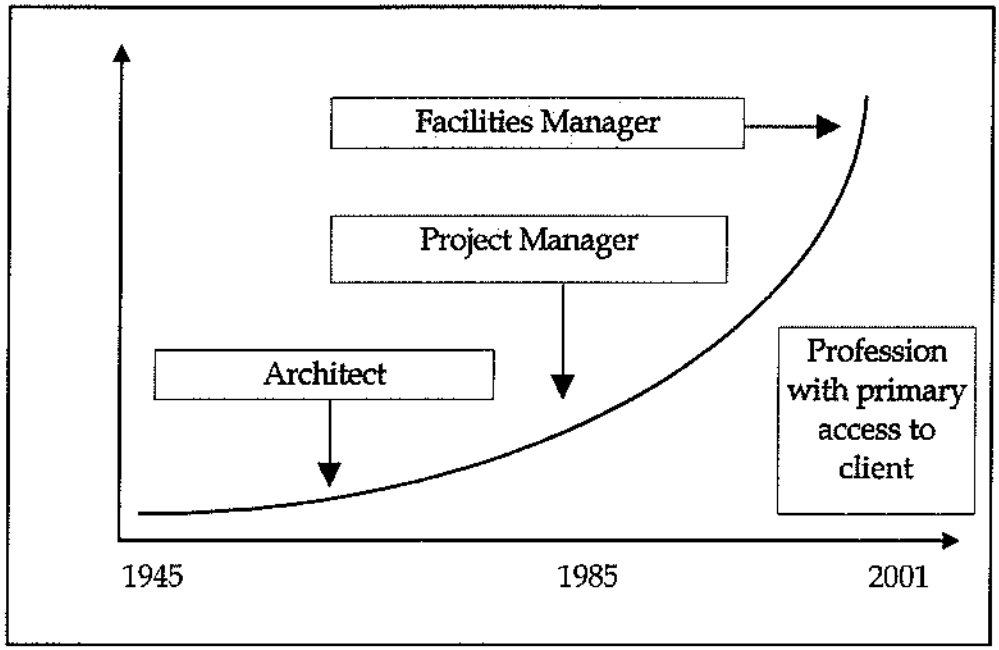

Figure 3 The changing roles of the professions

Figure 3 shows the ascendancy of professions in terms of client influence plotted on the Pareto curve.

The inherent logic of the Pareto influence curve is that in any complex decision making process the players with early involvement in the process have the potential (and opportunity) to make the maximum impact. It is interesting to see how this maxim holds good in terms of professional influence in the post war era, with the profession of Facilities Management emerging as one of the dominant players of the nineties. FM has been defined by the Centre for Facilities Management (Alexander 1996) as 'the process by which an organisation delivers and sustains support services in a quality environment to meet strategic needs.' Or to put it another way, the provision of a built environment which is aligned to an organaisations goals and objectives. The Total Facilities Management (TFM) approach is most apposite in terms of modern business corporations where there is a strong realisation of the impact of the physical environment on organisational goals and objectives. It is easy to see from this definition why FM is the fastest growing sector of the construction industry in Europe, USA and Australia. Our observations are that this trend is likely to be replicated in China.

FUTURE DIRECTIONS

As we have tried to illustrate in Figure 2 and 3 increasing client involvement and user participation in the provision and performance of buildings is likely to lead to an ever burgeoning and increasingly complex set of relationships between the users and producers of the built environment. For the present, Facilities Management is likely to be the generic discipline which can best exploit the potential of concepts such as partnering, constructability, total quality management, bench-marking , value management and reengineering. However, what is not yet clear is how to harness the collective power of these approaches. Nor how to adopt, adapt or discard these concepts depending on the cultural setting. Perhaps one fundamental aspect (or flaw) which is common to the way in which these concepts have been currently deployed by the industry is that the client has not been fully integrated into the procurement process. Take, for example, partnering although this approach has the capacity to include all the stakeholders, this rarely, if ever happens. More often than not the client, although involved, is to some extent slightly removed from the process. Although, for example, DPWS in Australia has produced a form of contract (C21) which can be used specifically in the partnering process, there is

still a sense of an 'us and them situation' between the client and the constructors. Even in the BOOT process is there still to some extent a sense of detachment on the part of the client, given that the client (usually a government authority) only takes possession of the facility at the end of the operating period. This means that in some cases the operating period can extend to between 40 to 50 years (as is the case in the recently constructed Sydney Eastern Distributor tollway).

One interesting development in terms of total involvement in risk sharing between client and developer is the increasing popularity of alliances. Doz & Hammel (1998) have described the growth of alliancing as one of the most dynamic features of modern corporate development Scarcely a day goes by without some significant new linkage being announced. These alliances are proving to be the prevailing sign of the flexible organisation and are a direct response to the changing corporate environment (De la Sierra 1995). According to the Economist Intelligence Unit (EIU) alliances of all kinds will rank as one of the most significant management tools by the year 2010. Involvement in alliances is currently cited by 29% of EIU respondents, moreover this figure is predicted to escalate rapidly to no less than 63% by 2010 (EIU 1997).

The alliance process has been described by Gerybadze (Gameson et al 2000).) as "...the client (our italics) and associated firms will join forces for a specific project, but will remain legally independent organisations. Ownership and management of the cooperating firms will not be fully integrated although the risk of the project is shared by all participants."

Perhaps the essence of alliancing can best be demonstrated by a description of a typical financial arrangement under a project alliance arrangement. A particular feature of alliancing relationships is the gainshare/painshare approach. This is illustrated in Figure 4

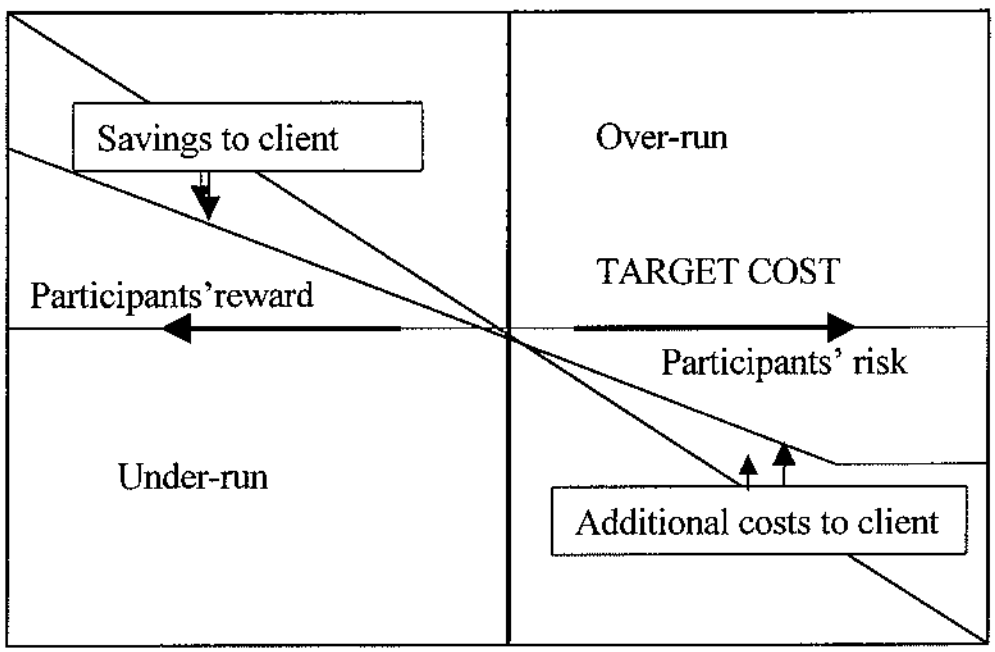

Figure 4 Gainshare/painshare alliancing agreement

Gainshare/Painshare

Under this alliancing agreement the gainshare/painshare scheme places as risk, the aggregate of the profit and corporate overhead components of all parties, based on the overall performance of the Alliance against the final cost. In the event of a cost overrun, the participants were to contribute 50% up to a maximum of the total of this profit and corporate overhead, but in the event of a cost saving, 50% of such saving was to be paid to the participants - with no cap, because there was no wish to diminish any incentive. No other penalty provisions were included because the client understood that

loss of gainshare, profit and overhead as well as the contribution to painshare, were adequate incentives for performance. The gainshare/painshare split among the parties was agreed based on a 50% allocation to the client with the remainder divided in proportion to each party's contribution in the overall target cost. If the project was completed at less than target cost then additional profits flow to the participants in proportion to their gainshare/painshare percentage. In the case of the project over-running the target cost then all the participants, including the client are liable for over-run in proportion to their gainshare/painshare percentage.

In our view, alliancing is an interesting combination of the market force culture of profit incentives combined with the cultural ethos of partnering and we believe this could be of particular relevance in the Chinese construction industry in its attempts to use market forces to improve time cost and quality and achieve the best outcome for stakeholders.

CONCLUSIONS

Rigby (1993) in his 'Secret history of process re-engineering' posits the notion that all management concepts go through a sequence of six stages viz. deficiency of previous concepts; discovery or rediscovery of a solution; euphoria as early success stories are publicised; over-extension due to the excessive application of the technique to inappropriate situations; derision as examples of failure grow too large to ignore; final abandonment as the technique is discarded or replaced with a new technique. In our attempts to chart current and future issues in construction management and economics we have tried to avoid this level of cynicism, however we are aware that we have probably exposed more problems than solutions. The last decades have seen notable changes in the structure of organisations (both Western and Chinese) as well as methods that managers' use in leading and directing these evolving organisational bodies. At the outset of this paper we described the introduction of the TCM as an interesting and very innovative response to a difficult and entrenched problem in the Chinese construction industry. We have also discussed cultural shifts in Western approaches to management and some of the difficulties involved in reconciling the current raft of competing management concepts.

We conclude by suggesting that that unpredictable social, economic technical and political aspects of a globalising society will force organisations to look at forming national and trans-national business alliances and we have touched on the emergence of alliancing as one way ahead. Certainly from our exposure to both Western and Chinese construction environments, we believe that both parties have much to gain and learn from each other.

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[1] In 1993, the Chinese Ministry of Construction (MOC) formally published its planning outline for the construction market, based on reforming the allocation of tenders - controlling the tendering process rather than attempting to control tenderers. The State Council resolution followed joint promulgation in July 1994, by the Ministry of Supervision and the Ministry of Construction, of ministerial directions regarding corruption and unfair competition, with emphasis on:

- Registration systems for construction projects
- The introduction and promotion of public bidding systems
- Banning Government Departments at the various levels from interfering with the bidding system
- Strengthening management to intensify supervision of bidding firms, to prevent collusive bidding
- Educating officials involved in the public bidding process to be honest
- Intensifying supervision of projects, as well as improving investigation and management of cases of corruption or mismanagement

One consequence of these ministerial directions was the establishment of the TCM.

FROM BEHAVIOURAL COMPATIBILITY TO PARTNERING

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ABSTRACT

This paper proposes a dimension of behavioural compatibility, varying from 'unfettered opportunism' to 'utmost good faith', along which behaviours are examined and a perspective on conflictual origins and performance consequences can be obtained. By considering projects as 'joint venture media' to achieve business objectives, the formalities of partnering relationships are scrutinised in terms of their perceived purpose, philosophical base, participants' attitudes held and behaviour promoted. This paper concludes that for partnering to operate, a suitable philosophical (cultural) perspective with consequent, appropriate behaviour is vital; imposed (temporary, superficial) behavioural modification is inadequate.

Keywords: behaviour, culture, joint-venture, objectives, projects, relationships.

INTRODUCTION

In formalised relationship frameworks of contract law, backed-up by tort, a basic requirement is for reasonable behaviour . That behavioural requirement is augmented by situational considerations - 'capacity' of the persons, special knowledge etc. Thus, at one end, the law looks to the intent of the parties to determine what is to be (reasonably) secured - in the absence of fraud and subject to increasing legislation of participant (consumer) protection, the parties are free to form any legal bargain - good or bad. In contrast, often, special relationships require much more open declarations/behaviours, i.e. relationships of 'utmost good faith'. Behaviour, and its oral complement language, constitute two primary, observable manifestations of culture. As such, they constitute expressions of underpinning beliefs, values and attitudes. Further, culture may be seen as dynamic and, in consequence, somewhat fuzzy. Whilst culture shapes behaviour, so behaviour, in turn, shapes culture (change).

CULTURE

One of the four dimensions of (national) culture, as determined by Hofstede, is individualism-collectivism; a fifth dimension of long termism-short termism was added later (Hofstede 1980, 1991). Opportunism (refer to Williamson's (1975) transaction cost analysis) and its possible extension into potential 'cheating' within 50:50 joint venture organisations (Buckley and Casson 1988), are other observable manifestations of (business) culture. Culture is manifested not just as 'how we do things here' but includes 'what', 'why', expectations of consequences in (socio-) structural contexts. It constitutes the framework of norms, acceptance limits of behaviour, concepts of justice and suitable repercussions for any transgressors (who are caught). Notably, it gives rise to attitudes and value-judgements - including 'guilt'/innocence. Whilst some societies may be characterised by an 'its too

problematic' attitude, others adopt a positive 'can do' attitude (Hong Kong?) until at the last moment - it proves to be impossible.

Especially manifested through language, cultures may be classified as high context - in which the word (linguistic symbol) carries a great deal of associated, assumed meaning - or high content - in which the word has a very limited, 'expressed' meaning. The high context - high content classification extends far beyond language to incorporate how business relationships operate. Such contextual components raise issues concerning awareness of the necessary assumptions and are likely to be the cause of incorrect interpretation and response. However, high content languages and societies may be equally vulnerable by being viewed as over-direct, abrupt, intolerant or rude. Thus, it is at the cultural boundaries/interfaces where the majority of significant problems are likely to occur.

PROJECTS

Projects may be regarded as media through which people pursue their business objectives. Contracts are increasingly complex and diverse. Project realisation relies on the informal, culturally derived system (Tavistock 1966) - as the historical Western but largely current Eastern approach - of relational contracting. Realisation occurs in spite of the contractual procedures unless/until failure occurs to sufficient extent to invoke the formal culturally derived system.

Adopting the project as a TMO (Cherns and Bryant 1984), the usual operating group is a coalition. The higher the degree of linearity in the processes, the greater is the opportunity for power-based influence of the shifting multi-goal coalition but with the degree of possible influence (power) decreasing sequentially. The impact of goal formulation, adoption and communication is fundamental to performance (e.g. Liu and Walker 1998, Bennett and Jayes 1995). Anecdotally, targets may be known but project goals are assumed.

Evolving project power structures (Newcombe 1994) provide opportunities and constraints on goal and target formulation/modification. Such opportunistic availability, patterns and degrees of pursuance determine project performance and, via outcomes, the distribution of satisfaction. Such outcomes can be realised only if there is behavioural compatibility, thereby invoking commitment. From a Western perspective, unamended standard forms of contract provide widely accepted meanings/implications through their well-known contents. Extensively amended standard forms, novel and bespoke contracts invoke high prices etc. as expressions of risk aversion. Outcome intent may be clear but process requirements and total risk distribution may be fuzzed. In the East, the intent has dominated in tandem with bidders' business objectives - commonly, long term - to impact performance.

Widely, the construction industry is fragmenting through increased subcontracting and specialisation but integrating through multidisciplinary practices, BOT and partnering. The dichotomy of performance pressures seems obvious. If it is appropriate to regard projects as the vehicle, then it is also appropriate to regard them as joint venture activities. The question then becomes "what is the degree of jointness" and whether the joint venture is a zero sum or a non zero sum game.

BEHAVIOURAL COMPATIBILITY AND PARTNERING

To give rise to a culture, behaviour must be common and compatible (e.g. Trompenaars and Hampden-Turner 1997). Consideration of a 'ladder of escalation of disputes' on construction projects reveals a power based scenario and progressive formality. Attention to formalities is addressing the symptoms rather than the cause(s). The formal behavioural frameworks are derived from informal acceptability. Sufficiently extensive and sustained changes in the informal system generate changes in the formal system (echoing Tavistock).

Womack et al (1990), Westwood (1992), recognise the familial, social-derived requirements of respect, harmony, sacrifice and dependence in yielding apparent trust-based behaviour in Japan etc. Taoist, underpinning Confucian, ideals of the negligible self leading, via self cultivation, to the noble self and thence, the synergistic whole generates overt recognition of the benefits of mutuality in which congruence of behaviour is essential and natural. That is in stark contrast to the pursuit of individual self-interest - a central pillar of market capitalism!

Partnering is an approach that allegedly may bring forth synergy among the participants in the construction procurement process. However, recent research questions whether "partnering" may be revolving around rhetorical issues only (e.g. Green 1998, Bresnen and Marshall 2000 a). From the latter point of view, partnering is a brand name, yet "No frills" sometimes may provide the same (or higher) quality products as the brands. This paper cautions that limited understanding and implementation of partnering would encourage rhetorics - the formation of a trap in technocratic totalitarianism in the construction improvement process (see Green 1998). Such totalitarianism is particularly easy to dominate in certain circumstances, e.g. when one organisation is overtly more powerful than the other.

The public sector in Hong Kong, notably in the housing area, has been actively advocating the adoption of partnering. The contractors are encouraged to see themselves as 'partners' with the public client in the procurement process. Consequently, an upsurge of interest in this 'new Western approach' arises - despite the fact that certain Western literature credits the Eastern way of business as inspirational to this Western partnering.

WHAT IS PARTNERING? DOES IT WORK?

In Hong Kong, skeptical contractors ask, "Does partnering work?" - In other, more general contexts, one mat ask, "Does marriage work?!" These are two rhetorical questions. However, partnering warrants serious scrutiny due to the recent upsurge of its reputation in alleged efficiency and effectiveness.

Partnering is a label given to describe certain business phenomena. Like marriage, which exists in various forms in different cultural contexts through time, it is a term designated to a form (or forms) of existence (business arrangements, societal livelihood patterns, or otherwise) involving more than one unit (individual, organisations, even nations). It can be formalised with a piece of paper (contractual) or informal with reliance on common terms of reference. A rhetorical question (does marriage/partnering work?) does not associate itself with specific answers.

There are many definitions given to this business phenomenon (especially in the construction industry) over recent decades (e.g. European Construction Institute 1997, Bennett et al 1996). Li et al (2000) give a recount of the literature search (hence, the definitions are not repeated here). However, Bresnen and Marshall's (2000a, b) papers demonstrate that the nature of partnering, which underpins our understanding of the various forms (and processes) employed in partnering, must be examined.

As it is difficult to distinguish between partnering as a distinctive practice and as a managerial rhetoric and the use of partnering methods per se does not necessarily lead to effective outcomes (see Bresnen and Marshall 2000a), partnering must be examined from the perspectives of its process and its nature. The process is a structural description of the partnering arrangement, i.e. the equity stake between the partners, the power structure, the organisation structure (of the partnering arrangement) and the signing of charter etc. The nature of the partnering arrangement is understood through an examination of the characteristics of partnering (the partnering culture). These characteristics include (see Bennett et al, 1996; Li et al 2000) conflict resolution, trust, common goals (or shared vision), mutual benefits (or equity), commitment, and respect. Hence, a partnering arrangement may exist with or without any formal organisation structure and contract.

Currently, it is alleged that partnering is not a form of contractual arrangement - having evolved from being an informal to a formal arrangement and back. It is not necessarily a procurement path either, although it can be used (e.g. through project organisation design) as such.

Business people talk about strategies (and strategic management) which are explained through visualisation and expected achievement of goals and objectives. In both partnership and partnering, when an individual or organisation approaches another to form a business relationship (this can be anywhere along the supply chain), anticipated benefits are the initial goals - for a firm requires long term benefits / normal profit to survive. A supply chain, as the name implies, delivers product(s). Anticipated benefits from the business relationship (partnering) derive from the transaction of products (say, sale) are shared by the partners. Hence, the partners, through identification of a common 'outsider' (or customer at the other end of the transaction) have an 'alliance' - psychological, formal, societal or otherwise. This occurs quite easily in private sector as the partnering arrangement may evolve naturally as a response to the environment. The 'marriage' of private and public sectors (although benefits are alleged by Mitrovic 1999) may require more 're-engineering' and shifts of both mechanistic processes and behavioural paradigms - the structuration and culturation phenomenon in Liu and Fellows (1999).

MECHANISTIC DIVIDE — PROJECT PARTNERING AND STRATEGIC PARTNERING

The West has adopted the partnering approach with, basically, two common forms: project partnering, where the parties come together for the duration of a particular project, and strategic partnering, where the parties develop a longer term relationship over a series of projects for which contracts are usually negotiated.

Project partnering is recommended for public clients who must use market testing to comply with procurement regulations (such as those in the European Community), normally through the competitive tendering process (Loraine 1994), to ensure visible public accountability.

The questions - stemming from such mechanistic divide - include:

1. Is partnering merely new clothes for the emperor? If the negative effects of tendering are acknowledged yet tendering must be retained for public accountability, the 'traditional' tendering process must undergo major modification to demonstrate/convince that it is a new phenomenon - let it be named project partnering.
2. If the contractor's performance is satisfactory and the likelihood is that employment would continue in the next project, partnering must be 'dressed up' so that the process (or rationale) of engaging the same contractor is different from that resulting from prequalification-cum-selective-tendering, continuation contract or even serial tendering; otherwise, there is no brand name.

To explain the differences necessary for partnering to stand out from previous tendering/contractual arrangements, mechanistically defining the partnering process is adopted (e.g. how to conduct workshop in order to arrive at an agreed charter). The nature of partnering defines the culturally driven business approaches and does not offer much to answer the questions raised above. Yet researchers are advocating that it is the nature of partnering that dictates what it is, i.e. full benefits can only be realised as relationships develop, learning progresses, trust and commonality of interests are fostered (Liu and Fellows 2000). In a business world, the commonality of interests (and mutual benefits) are particularly important for, without these, there is, arguably, no need to form partnering.

BRAND NAME MYTHS

• Quality products

Quality products in the consumer market are associated with price tags - consider a pair of trainers from the authentic Nike shop and those being sold as copy products: what are their differences? (If one argues that there are none, we do not need to advocate performance appraisals but may rely on open tendering). Quality is a dimension of production and is a manifestation of both economic (such as production cost) and managerial elements (such as management functions in the organisation structure and the production process). To raise quality would, at least, need to address these two areas.

Consider the partnering examples in other countries/industries. In the context of upkeeping quality of products, arrangements have to be made physically and financially viable through changes in the production process - reconsider the concepts of economy of scale, transaction cost, total quality management (not QA alone) etc. - partnering per se does not lead to quality outputs.

• Trust in teamwork

Much literature advocates that trust is fundamental in the partnering arrangement. "Trust me, I am an honest, meek and mild Chinese wife" - this alone will not get (me) very far when approaching banks for mortgages and loans. The likelihood is that when partnering commences, trust evolves - 'time will tell!' It is a cyclical chicken-and-the-egg process.

The idea that with "trust underpinning the partnering arrangement, the partners can move forward to attain the common goal of producing quality products" is over-simplification. Consider the statement of "with love, the prince and princess live happily ever after". The issue of bread and butter is as important and when belts are tightened, the noble self (trustworthy, honourable, self-sacrificing etc.) comes under test. One should refer to the psychology paradigms in understanding the operation cycles of trust building and re-building.

• Mutual benefits

Partnering is a business arrangement - a resultant of market environmental forces - a phenomenon that occurs with or without consciously bearing the enshrined label (of partnering). The coming together of firms is not a 'forced process'. To respond to the environment, the organisations adapt with changes that allow them to make their long term normal profits to survive and grow. When one invest, would one not inquire about returns? To induce a partner to join, identify the benefits for the partner. Make the 'partner' a decent business proposal!

Benefits - not threats! To induce someone to join your business by posing/emphasising the negative resultants of 'what ifs' (what if you don't join) is hardly following the principles of partnering. For a powerful organisation to 'force' partnering on others, chances are that the smaller less-powerful potential 'partners' will join - but this arrangement might as well not be named 'partnering' but 'corporatism' (refer to Green 1999 for corporatism).

THEM-AND-US SYNDROME

Can the partners be able to see 'eye to eye' with each other? The root might lie in the them-us syndrome in the case of client - contractor partnering. Traditionally, project operations are carried out through a hierarchical structure of professional consultants (on the client's side) and the production team (on the contractor's side). Along with this structure develops a dividing line as the basis for 'blame apportionment' when things go wrong. This is manifested as 'culture of adversarialism' (Liu and Fellows 1999)

While the directors at the 'strategic apex' (refer Mintzberg 1989) may decide that partnering is the way forward, the belief and behaviours of personnel at the 'operating core' may dictate the operationalisation of the them-us approach in adversarialism. A possible scenario is that the directors might wish for partnering but the operatives do not have a clue what it means.

RHETORICS AND SKEPTICS

Rhetorical questions and arguments are unfocused - does partnering work/does marriage work? Partnering of firms as a resultant of market forces is like marriage after courting. Forcing others to join is like arranged marriages. But that alone may not dictate whether the partnering/marriage would work out. When choosing a partner, the argument is to look at past records, past business relationships etc., which is a sound business approach. Skeptics who doubt if 'partnering would work' may need to define / refine the question.

Other skeptics view the brand name as a label for 'corporatism' (e.g. Green 1999). It had been alleged that tendering, in most cases, works with an adverse effect on quality of output (services/ products) - especially in unfavourable/tight market conditions. Tender, on the other hand, demonstrates accountability. The seemingly logical move to partnering - heavily relying on selection, hence, borders on corporatism - runs the danger of countering what has just been advocated.

PRIVATE AND PUBLIC

The private and public sectors face different environments. Private organisations already arranged themselves in various forms of partnering (but without labelling themselves and informing the world), some through formal financial cross holdings of company shares. Benefits/gains are the usual commencement point in making any investment or business deals. The anticipated benefits must materialise (albeit to various extent) to keep the business relationship - a starting point for building trust. Public sector faces the issue of public accountability. Since a public organisation is not to be viewed as a business entity, the nature of their 'organisational goals' differ quite significantly from the private organisations'. The identification of mutual benefits is, however, still essential to induce partnering. There are two aspects involved:

1. The factors conducive to partnering must be present. "Most public works projects are not profitable enough and involve high risks on a private only basis if customers are to be guaranteed low cost of services. On the other hand, a purely private funded project would be tempted to maximise revenue, to the extent that it may fail to deliver socio-economic benefits. Public-private partnership seems to provide the optimum solution for these potentially conflicting objectives." (Mitrovic 1999: 198). Consider the cases of infrastructure projects with private sector participation.
2. It is advantageous that the mutual benefits are clearly defined, especially in the case of a "one night stand" as in project partnering. Bresnen and Marshall (2000b) may provide some insights from their share of gain - pain formulae between the client and the contractor which could be applied in the client - contractor partnering scenario.

CONCLUSIONS

The apparent trusting behaviour in the East reflects a long term perspective and networks of reciprocal obligations - responsibility, authority, self sacrifices and face are reflected in social and business structuring. Projects are viewed naturally as joint venture business media in which performance is

secured via mutuality which, of its nature, reduces (potential) conflict and, via (perceived) involvement, enhances performance.

The philosophical and cultural basis is ancient and complex, including several major religions. Those societies emphasise harmony and respect within well defined and accepted structures in which 'progression' follows ascription (rather than achievement) as the basis of holistic wisdom (rather than technical expertise), perhaps, thereby avoiding the "Peter Principle"?

Partnering is a label - evolving itself into a brand name. To understand the formation and guarding the sustainability of brand names requires the organisations to make constant adjustments and responses to the environment. Most of all, the importance of understanding the technical, economic and managerial aspects of producing quality products is paramount - after all, what's in a name? Partnering has a mechanistic (the process) and an organic (its nature) component. The more one tries to define the term - partnering - mechanistically and deterministically, the more one misses the essence of what it is. To hide behind the veil of the brand name is best noted by Green (1999:12), "the reality of the situation is more one of mindless compliance caused by intellectual laziness".

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STUDY OF PROJECT PARTNERING IN HONG KONG

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ABSTRACT

The adversarial relationship between clients and construction contractors creates an environment, which jeopardizes the success of the construction industry as a whole. The client and the contractor represent two distinct organizations with separate set of objectives, management styles, and operating procedures. In most cases with the traditional procurement system, members of the two management teams do not normally know one another prior to the start of the project. Previous studies suggest that project partnering can be used successfully in building projects and provide time and cost benefits to both clients and contractors. A research task force has been set up in the Department of Building and Real Estate of the Hong Kong Polytechnic University to evaluate the performance of project partnering and investigate ways how the industry can implement these systems successfully in the Hong Kong context. The aim of this paper is to provide an interim report on an on-going research of project partnering. The characteristics of the partnering process and the significant ingredients that make up a good partnering venture will be discussed. A research framework will be proposed to facilitate the evaluation of project partnering in Hong Kong.

Keywords: Project partnering, project success, Hong Kong

INTRODUCTION

The construction industry is a very competitive, high-risk business. They are facing many problems like little co-operation, limited trust, and ineffective communication resulting in an adversarial relationship between each party. This kind of relationship is reflected in construction delays, difficulty in resolving claims, cost overruns, litigation, and a win-lose climate (Moore et al, 1992). Thus, this relationship has made the need for a new approach all the more urgent. This need is compounded by the experiences of many within the industry, who, in the past, have suffered as a consequence of litigation or arbitration processes whilst attempting to resolve difficulties.

Many new management techniques have gained popularity to help solve these hurdles (Sanders, 1994; Eckert, 1994; Schriener, 1991). Partnering is one such technique, which attempts to create an effective project management process between two or more organizations. It aims at generating an organizational environment of trust, open communication and employee involvement (Sanders and Moore, 1992). This is achieved through the rapid creation of a project culture, to fulfil the function, which is served by a corporate culture in longer lasting organizations.

DEFINITION OF PARTNERING

There are various definitions of partnering from past studies. Indeed, Partnering is a process of establishing a moral contract or charter among the project team members which will bind each party to act in the best interest of the project and the project team members.

Crowley and Karim (1995) used an organization's point of view to define partnering. Partnering can be conceptually viewed as an organization that is formed by resolving conflicts, expediting decision-making and increasing organizational competence in achieving project goals (Figure 1).

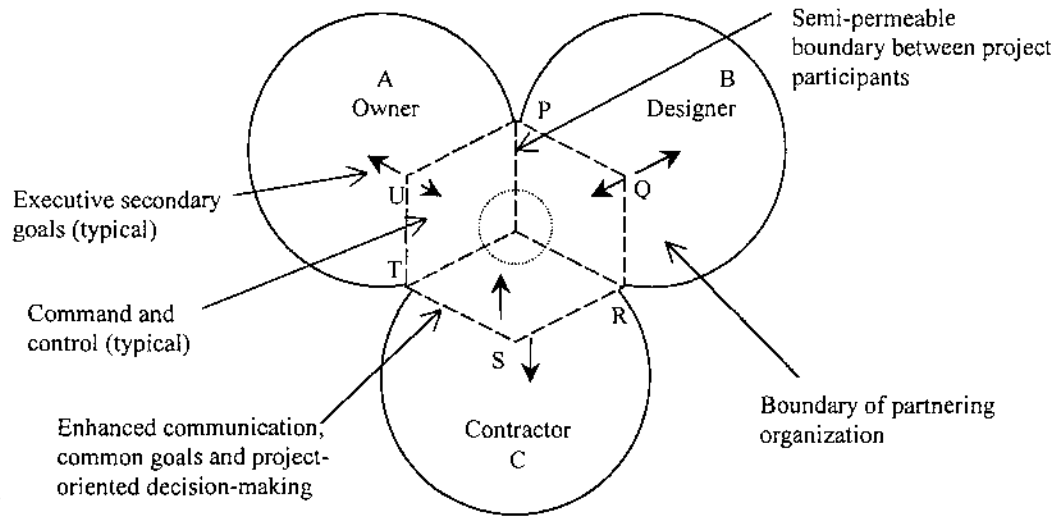

Figure 1. Conceptual model of partnering (Crowley and Karim, 1995)

The United States, Construction Industry Institute (CII, 1991), and United Kingdom, Construction Industry Board (CIB, 1997), conducted some famous research in partnering. They had developed their only definition of partnering.

The CII (US) defines partnering as:

> *"a long-term commitment between two or more organizations for the purposes of achieving specific business objectives by maximizing the effectiveness of each participant resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based on trust, dedication to common goals, and an understanding of each other's individual expectations and values."*
>
> *(CII, 1991)*

The CIB defines partnering as:

> *"a structured management approach to facilitate team working across contractual boundaries... it should not be confused with other good project management practice, or with long-standing relationships, negotiated contracts, or preferred supplier arrangements, all of which lack the structure and objective measures that must support a partnering relationship"*
>
> *(CIB, 1997)*

CHARACTERISTICS OF PARTNERING

Commitment

The most important element in establishing a partnering relationship is commitment from senior management (Morgan and Dowst, 1988). It must be visible, supportive, ongoing and sensitive to

organizational change (CII Aus, 1996). Although the jointly developed partnership charter is not a contract, it should be strongly and widely communicated to all within the whole project community when the commitment is made (Hellard, 1996).

Equity

All the stakeholders' interests are considered in creating mutual goals and there is commitment to satisfying each stakeholder's requirement by utilizing win/win philosophy (Hellard, 1996). It reflects a sense of proportionality and balance transcending simple fairness (CII Aus, 1996).

Trust

Teamwork is impossible where there is cynicism about partners' motives. With understanding of each shareholder's risks and goals, mutual trust developed within parties comes the possibility of synergy (Hellard, 1996).

Goals and Objectives

At a partnering workshop, the stakeholders identify all respective goals for the project in which their interests overlap. Typical jointly developed goals include achieving value engineering savings, project delivery on or before time, maintaining desired quality, etc. (Hellard, 1996; CII Aus 1996).

Win-Win Philosophy

As partners work together toward a common goal, each party agrees to examine each situation and strive to attain a win-win solution (Slater, 1998).

Implementation

At the workshop, stakeholders together develop strategies for implementing their mutual goals and the mechanisms for solving problem (Hellard, 1996).

Evaluation

In order to ensure implementation, the stakeholders should agree to a plan for periodic joint evaluation based on the mutually goals to ensure the plan is proceeding as intended (Hellard, 1996). Continuous joint evaluation ensures adherence to the agreement and provides a valuable learning process (CII Aus, 1996).

SIGNIFICANT INGREDIENTS FOR MAKING PARTNERING SUCCESS

Adequate Resources

Since resources are scarce and competitive, it is not common for an organization to share its own resources with the others. The main resources include knowledge, technology, information, specific skills and capital. Several researches pointed out the importance of shared resources (CII, 1991; CIB, 1997). It is also significant to ascertain the maximum use of shared resources. The complementary resources from different parties not only can be used to strengthen the competitiveness and construction capability of a partnering relationship (Cheng et al, 2000), but also a major criterion of the partnering success.

Top Management Support

Commitment and support from top management are always prerequisite for a successful partnering project. As senior management formulate the strategy and direction of business activities, their full support and commitment are crucial to initiating and leading (Cheng et al, 2000).

Mutual Trust

For a successful partnering project, parties involved must have mutual trust towards the other partners. They should have the belief that the others are reliable in fulfilling its obligations in an exchange relationship. It is crucial to "open" the boundaries of the relationship as it can relieve stress and enhance adaptability, information exchange and joint problem solving and promise better outcomes (Mohr and Spekman, 1994; Cheng et al, 2000).

Long-term Commitment

Long-term commitment can be regarded as the willingness of the involved parties to integrate continuously to the unanticipated problems (Cheng et al, 2000). More committed parties are expected to balance the attainment of short-term objectives with long-term goals and achieve both individual and joint missions without raising the fear of opportunistic behaviour (Parkhe, 1993; Mohr and Spekman, 1994).

Effective Communication

Partnering requires timely communication of information and the maintenance of open and direct lines of communication among all team members. For the construction project, problems need to be surfaced and solved on site immediately. If it is only used for routine matters while important issues are sent from each site office back to the respective home offices and then back to the site before any interaction, partnering will fail (Moore et al, 1992). It is clear that effective communication skills can help in facilitating exchange of ideas, visions and resolving difficulties (Cheng et al, 2000).

Effective Coordination

Coordination reflects the expectations of each party from the other parties in fulfilling a set of tasks (Mohr and Spekman, 1994). Effective coordination resulting in achievement of stability in an uncertain environment can be attained by increase in contacts between parties and sharing of information.

Productive Conflict Resolution

Because of incompatible goals and expectations, conflicting issues are common among parties. Conflict resolution techniques like coercion and confrontation are counterproductive and fail to reach a win-win situation. In fact, the conflicting parties look for a mutually satisfactory solution and this can be done by joint problem solving to create alternatives for the problematic issues. Such a high level of participation among parties may help them to create a commitment to the mutually agreed solution (Cheng et al, 2000).

RESEARCH FRAMEWORK

This research consists of an empirical study to evaluate the applicability of project partnering in the Hong Kong construction industry. It specifies the partnering process, the role of the parties involved, the risks and liabilities that each party is subject to, and identifies the significant ingredients that make up a good partnering venture. The future of project partnering will be evaluated and the best practice in the Hong Kong context will be developed.

Problem Identification

Building works have been delivered in a traditional manner where clients appoint consultants to act on their behalf to produce design and supervise the construction phase. The adversarial relationship between clients and construction contractors inherited in this procurement system is one of the major hurdles to jeopardize the success of the construction industry. The industry bodies started to recognize that if the construction were to compete for investment funds, particularly internationally, both the methodology and the public image of the construction industry would have to be re-engineered. Partnering is one such approach, which attempts to create an effective project management process between two or more organizations.

Research Objectives

The specific objectives of the proposed investigation are to:

1) To ***Analyze*** the partnering process in terms of:
   - Organizational structure.
   - Duties and responsibilities of the parties involved.
   - Lines of communication, control mechanism and types of partnering charter used.

2) To **Identify**
   - How client, consultant and contractor, supplier, and subcontractor organization view partnering system.
   - What are the client's criteria of satisfaction.
   - Why project partnering is preferred to procurement methods.

3) To **Evaluate**
   - The performance of project partnering in terms of client's criteria of satisfaction, i.e. time, cost, quality, and other areas of satisfaction.
   - Problems associated with project partnering, the risks and the liabilities that the clients, consultants, contractors, suppliers, and subcontractors will be subject to.

4 To ***Develop***
The future and the best practice of project partnering to suit the Hong Kong market.

Research Methodology

A research process model which is developed by Sekaran (1992, cited on Walker, 1996) will be applied in this research. This model provides a helpful process for basic and applied research. This model is to convert the vague ideas from research team into testable hypotheses that are designed specifically for the research questions. (Walker, 1996)

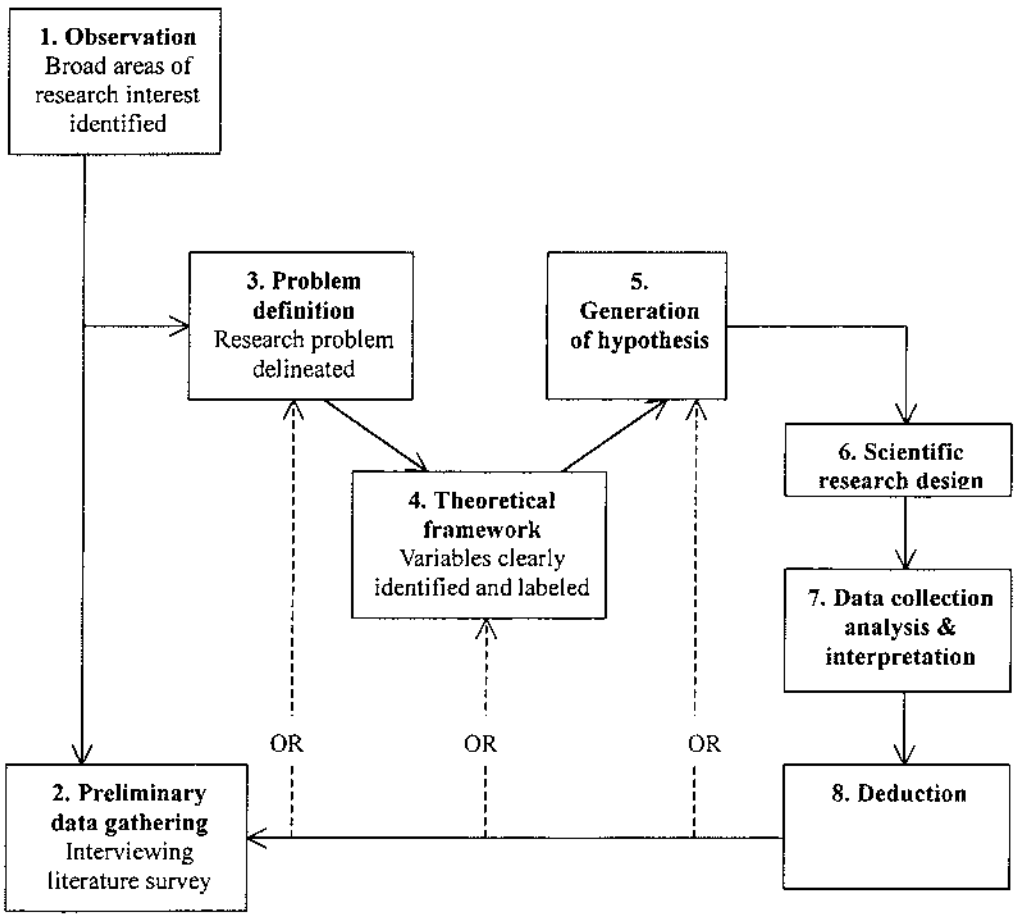

Figure 2. Research process for basic applied research (Sekaran 1992, as cited in Walker 1997)

The specific methodology of this research will follow the concept of Walker's model which will be based on literature review, questionnaire, interviews and case studies (Figure 3).

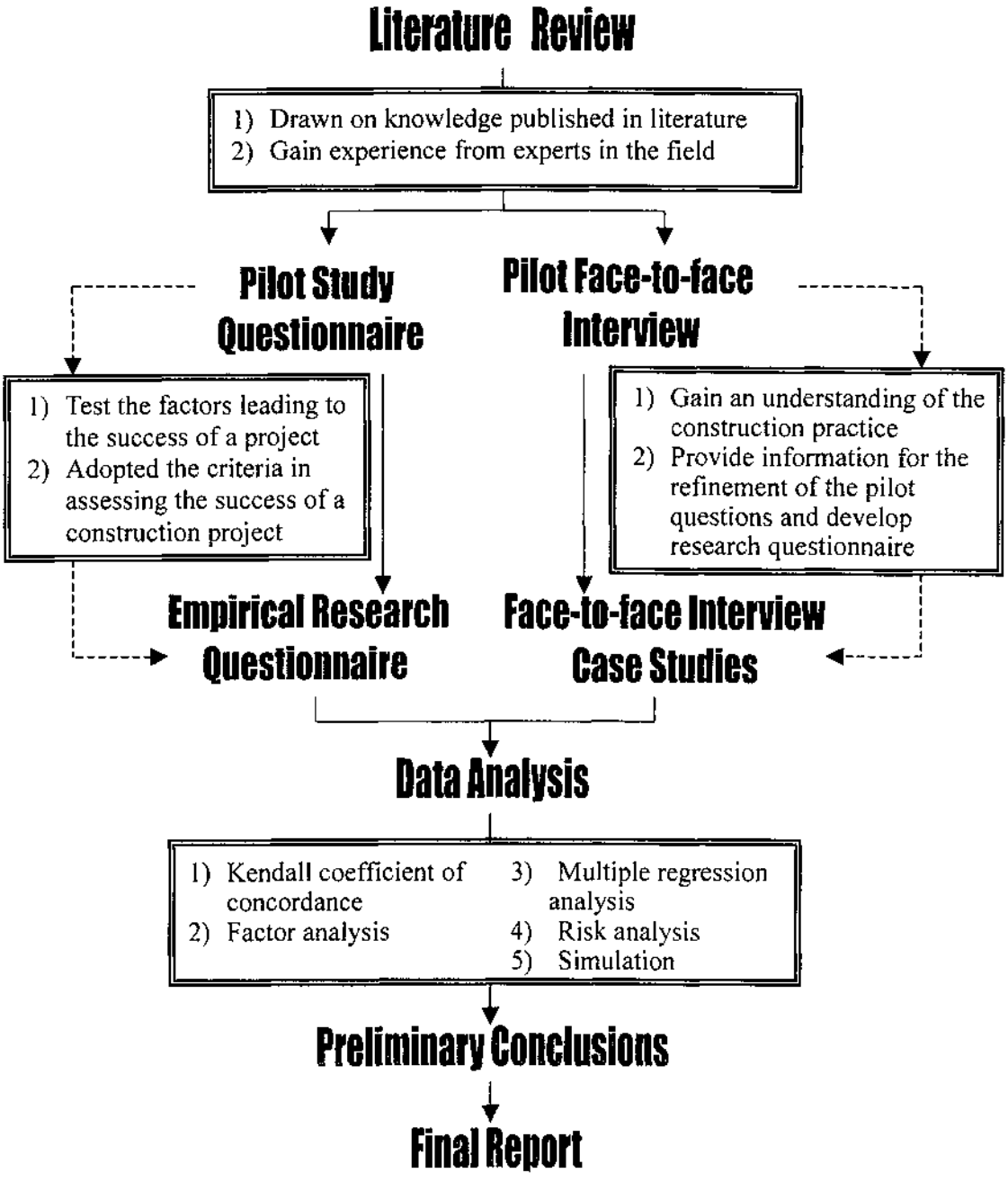

Figure 3. The research framework for this study

1) Pilot Study

A pilot study will be carried out to develop the empirical questionnaire. Walker (1997) concludes that a pilot study proves to be useful tool in providing a focus mechanism to establish the research direction more clearly. This is a critical stage to identify the significant ingredients that make up a good partnering venture and the evaluation items for the best partnering practice.

2) Questionnaire Surveys

The pilot questionnaire survey will be drafted to test the factors leading to, and the criteria adopted in assessing the success of a construction project. Face-to-face interviews will be conducted to gain an understanding of the construction practice in Hong Kong as well as to provide information for the refinement of the pilot questionnaire and the development of the research questionnaire. The empirical research questionnaire will be reviewed by the pilot survey participants and their comments will be incorporated to develop the final questionnaire.

3) Face-to-face Interview Surveys

The face-to-face interview survey will be carried out to facilitate the specify practice of partnering projects in Hong Kong. Background information about interviewee's organization and relevant projects will also be collected to strengthen researchers' understanding of interviewee's decision on partnering project. In addition, the data will be documented and compared with secondary, archival data pertaining to the rationale of adopting partnering project whenever possible. The targets of interview include client's organization, consultant firm, contractor, sub-contractors and suppliers.

4) Case Study Method

The case study method will be carried to collect the actual information in industry. It investigates a contemporary phenomenon which is vital to the viability of research study.

5) Data Analysis

The result of the questionnaire survey and interviews will be analysed to explore the participants' view on the partnering. Non-parametric statistical technique will be used to analyze the research findings. The Statistical Package for the Social Sciences (SPSS) will be used to handle the statistical calculations.

Kendall's Coefficient of Concordance (W) will be computed to test the same nature group comparison. This statistical analysis aims to ascertain whether the respondents within a group responded in a consistent manner. A high or significant value of W would reject the null hypothesis that there is a complete lack of consensus among responses within a group. Factor analysis will be used to test the relationship between partnering performance and also the problems associated with project partnering. Finally, a regression model will be developed to examine the practices in the constriction industry in Hong Kong.

Details of the analytical techniques are given below:

a. Kendall coefficient of concordance

Kendall's Coefficient of Concordance (W) is a statistical analysis which aims to ascertain whether the respondents within a group responded in a consistent manner. A high or significant value of W indicates that the different raters are essentially applying the same standard in ranking the objects under study. Thus, if there is a complete lack of consensus among the respondents on the ranking of the objects under study, W will be zero. A perfect agreement on the other hand will result in W having a value of one.

b. Factor analysis

Factor analysis is a statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables.

c. Multiple regression analysis

A regression model is a mathematical model, which can relate a number of independent variables to a dependent variable. The technique is one of the most versatile data analysis procedures. Regression can be used to summarize data as well as to study relations among variables. When more than one independent variable is needed in the regression model, it is called a multiple linear regression model. Multiple linear regression extends bivariate regression by incorporating multiple independent variables.

d. Risk analysis

A commercial computer package will be used to identify the risk sources, assess their effects and develop management response to these risk factors in choosing a partnering system.

e. Simulation

Simulation will be used in conjunction with the risk analysis to identify the risk sources and predict the likely outcome of project partnering. A computer package will be used to aid the process.

6) Research Documentation

After the data analysis, the preliminary conclusions will be drafted. The final finding will be discussed with senior industry practitioners involved in the study to help understand the relevance of findings in context with changing circumstances prevailing over the period studied. The document of research findings, i.e. the preparation papers and reports, provides guidance on project partnering systems and their implementation.

CONCLUSION

This paper is an interim report on an on-going research of analyzing project partnering in Hong Kong. It reviews the characteristics of the partnering process and the significant ingredients that make up a good partnering venture. The research framework illustrates the research process and research methodology. The proposed research will comprise of the pilot study, questionnaire surveys, face-to-face interviews and case study. A triangulated approach will be adopted to ensure data validity. Various analytical techniques will be also used to derive findings for the research study.

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THE HONG KONG HOUSING DEPARTMENT'S NEW MILLENNIUM INITIATIVES ON QUALITY PUBLIC HOUSING

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ABSTRACT

For the last 45 years, the Hong Kong Housing Department has been making recognizable improvements to the design and construction of public housing. In parallel, quality has risen to keep pace with the increasing aspirations of the 'clients' (both internal and external). This paper briefly sets down what has been achieved. It then describes the main initiatives currently being developed for the continuous pursuit of quality. Technically, quality has evolved through standardization and modular design of domestic blocks and incorporating the use of large panel formwork construction, precasting, prefabrication and standard components. Designs have been changed to improve both the durability and enhance the aesthetic of public housing. The improvement in quality through adoption of this systemized approach to construction has proven to be very positive. Nevertheless, this does not make further improvement less pursuable. At present, the Department is examining further quality improvements through enhancement of contract management procedures and monitoring systems

Keywords: Benchmarking, Site Inspection, Communication, Independent Checking Teams, Performance Assessment Scoring System (PASS).

INTRODUCTION

Technically, quality in the Housing Department (HD) has evolved through standardization and modular design of domestic blocks and incorporating the use of large panel formwork construction, precasting, prefabrication and standard components. Designs have been changed and control over building materials increased, to improve both the durability and also enhance the aesthetic of public housing. In addition, direct management of the department's own list of building contractors has allowed the operation of mechanisms for rewarding good performance and penalization of unsatisfactory performers.

These improvements in quality through adoption of this systemized approach and establishment of a construction quality assurance system have proven to be very positive. The milestones achieved since 1985 have been:

Table 1 - Quality 'Milestones' In The 80s And 90s

Year	Milestone	Quality Context
1985	Mandatory use of Large Panel Form-work to replace traditional timber forms	Quality Control/Assurance
1985	HD's own Materials Testing Laboratory established	Quality Control/Assurance
1988	Harmony block Series promulgated introducing modular flats and standardized components	Quality Assurance
1990	Housing Authority List of Contractors promulgated	Quality Assurance

QUALITY HOUSING

Recently however, quality problems on public housing projects have somewhat diminished these efforts. As a result, HD completed a comprehensive review on the public housing production process, which has identified a series of strategies and recommendations for enhancing building quality. These recommendations were set out in a public consultation document entitled "Quality Housing - Partnering for Change". Its reforming vision is "To provide quality housing together with all stakeholders through partnering and sustained improvement such that the community can take pride in our housing construction." A total of 40 initial main recommendations (finally 50) have been embodied in this public housing consultation document. One of the major initiatives is, " To strengthen the objectiveness, representativeness and coverage of building contractors' performance appraisal system by introducing PASS 2000 from April 2000 onward." This has resulted in a proposed 're-engineered' PASS currently called PASS 2000 (probably to be called PASS [Millennium Edition].

ABOUT PASS 2000

The family tree of PASS 2000 is as follows:

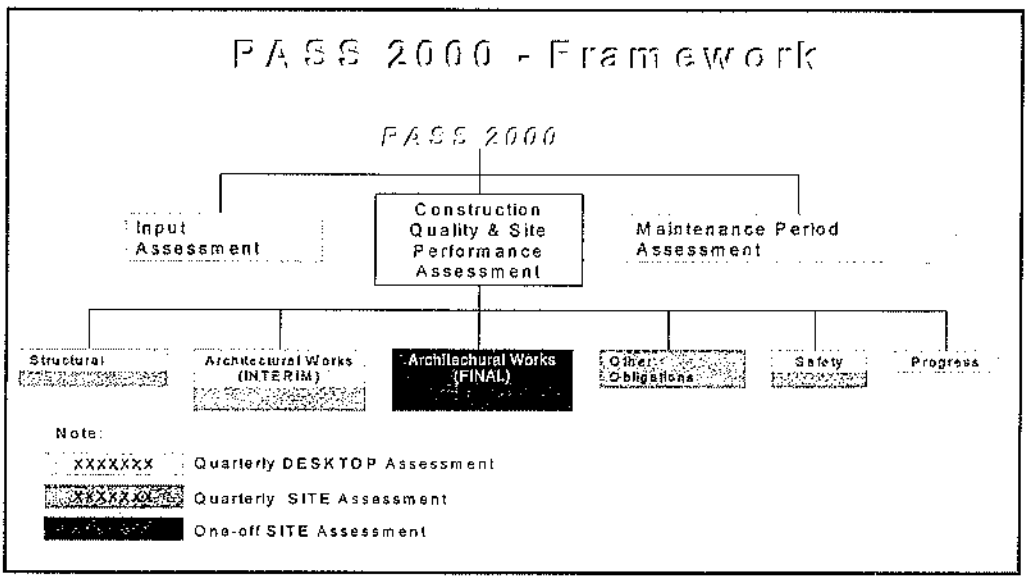


Figure 1 - PASS 2000 General Framework

Assessments are to be conducted by way of routine regular site inspections by the project staff and quarterly assessments by a special multi-disciplinary Independent Team (IT). The Contractor's Authorized Representative (CAR) will be present at the Architectural Works (FINAL) Assessment. Project professional officers continue to be fully responsible for the overall management of the contract and for monitoring the quality control by the contractor over the works. PASS 2000 assessments are not intended to replace the normal checks, inspections and tests to be carried out by the project team, or to reduce their overall authority, or powers under the contract. PASS 2000 is, nevertheless, seen as a complementary, checking system for the various critical aspects of the works. Results of PASS 2000 assessments will be used to guide contractors on work aspects, or trade procedures, that require improvement and will be a practical and continuous assessment tool in persuading, training and instructing contractors to improve their performance. Statistical trends generated by the system, will be used to discuss with the construction industry, generic deficiencies and together, formulate improvements in such areas.

Independent Checking Teams

In order to verify that PASS 2000 assessments are conducted in a fair and consistent manner and to ensure credibility of the system, the IT mainly carries out assessments with the assistance of the project staff. A rigid control system has been established to ensure the adequacy of data entered into the system and the operating methodology of this system is as shown below

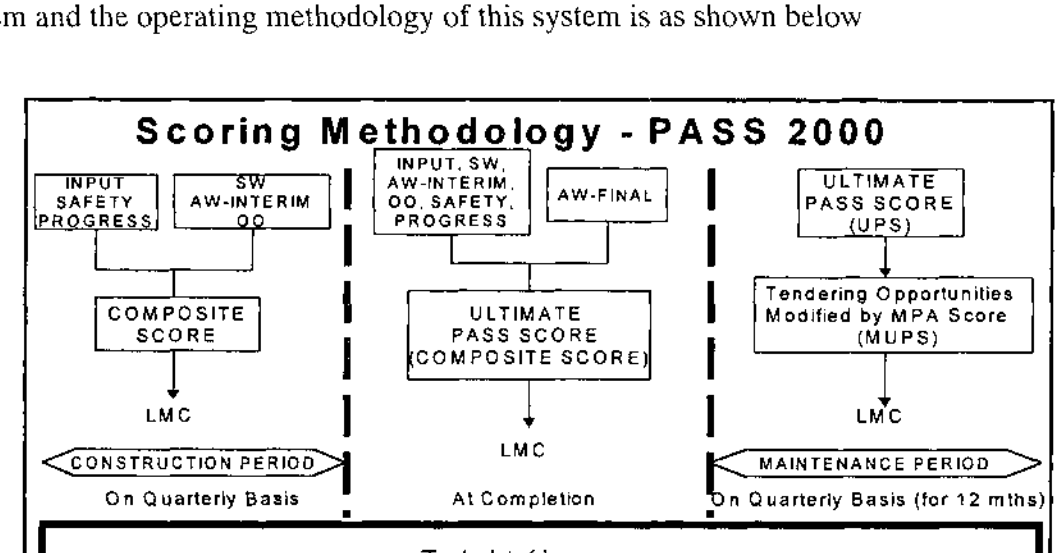


Figure 3 - PASS 2000 Scoring Methodology

Besides ensuring adequacy of data, the 3-tier control system allows areas of deficiency in assessment, or in project team misunderstanding of the standards, to be specifically identified and training can then be provided to inspectors/assessors in such cases.

Special Audits

In addition, special audits are carried out on the PASS 2000 assessments themselves and on any other part of the general system. Any resultant audit reports will be reviewed by the Pass Control Unit's (PCU's) Senior Manager who will then recommend to Chairman of the Contractors' Performance Review Committee (CPRC), removal of any doubtful scores on certain aspects/factors, where serious cases of over-rating or under-rating have occurred.

Strategic Milestone Monitoring

This monitoring mechanism allows any signs of slippage in progress to be identified at milestones staged along the critical path of a construction programme. At the same time, it will facilitate project teams to ensure that this non-performance is properly rectified at stages corresponding to the milestones.

In the current project monitoring system during construction stage, both the contract team and the project management team have to spend a lot of effort in the progress monitoring. Comparison is made of achieved progress against a contractor's master programme.

In the PASS 2000 Progress Assessment, milestone dates for key events during construction and at completion stage which may affect timely completion of the Works, are required to be set down in the contractor's programme as an objective basis for progress assessment. This assessment is really examining the comprehensiveness of the contractor's programme.

The list of milestone events for monitoring includes critical activities such as superstructure work and some building services installation (e.g. permanent power energization), critical stages in finishing works, such as sample flat approval and confirmation of works 'in progress'. Such systematic monitoring helps to minimize the delay due to slow progress in finishing works and poor workmanship, which was often only brought to light at the lattre stage of the contract. As a general guidance, the dates for the milestone events of a 24-month building contract consisting of 41-storey standard domestic blocks are given as a benchmark template for comparison or reference:

Table 2 - Milestone Dates for Structural Works

Milestone Dates *(From commencement of Contract)*	**Events**	**Remark**
Month 2.5	Completion of R.C. Work to G/F slab	Monitor substructure works
Month 6	Completion of R.C. Work to 6/F slab	Monitor works getting into proposed cycle
From start of Month 7	Achieve cycle time for typical domestic floor	Monitor superstructure work
Month 15.5	Completion of Main Roof	Monitor completion of superstructure works
Month 18	Completion of Upper Roof including lift machine room, roof water tank and roof parapets.etc.	Monitor completion of superstructure works

Table 3 -Milestone Dates for Architectural Works

Milestone Dates *(From commencement of Contract)*	**Events**	**Remark**
Month 10	Completion of Sample Flat/Wing and inspected by Contract Manager	Set quality standard and assure early start of finishing
Month 12 (Architectural Works 1)	Completion of 20% of plumbing and drainage installation; and 20% of wall and floor tiling to domestic blocks	Monitor progress of Architectural and Utilities works
Month 18 (Architectural Works 2)	Completion of 75% of plumbing and drainage installation; 75% of wall and floor tiling and plastering; and 50%of component installation to domestic blocks	Monitor progress of Architectural and Utilities works

Table 4 - Milestone Dates for Works Prior to Completion (Builder's Related)

Milestone Dates *(for reference only)* *(time before original/extended contract completion date unless specified otherwise)*	**Events**
5 months	Complete dismantling of tower crane
3 months	Complete roofing construction including finishes
3 months	Complete bamboo scaffolding dismantling
2½ months	Complete temporary refuse chute dismantling
2½ months	Complete glazing installation
3 months	Complete material hoist dismantling
1 month	Complete bamboo scaffolding dismantling at previous material hoist area
1 month	Complete watertightness tests with at least 80% passing rate (refer to ASM records)
2 months	Commence Final Inspection

The proposed assessment methodologies aim at systemizing and enhancing the current good practices in project monitoring for added programme assurance through the following measures:

- Identify milestones based on contractor's own programme throughout construction so that potential delays between these interim targets can be quantified, contained and timely remedied;
- Sound out potential delay warning; and
- Trigger escalative monitoring action in the event that consecutive milestones are missed.

Benchmarking

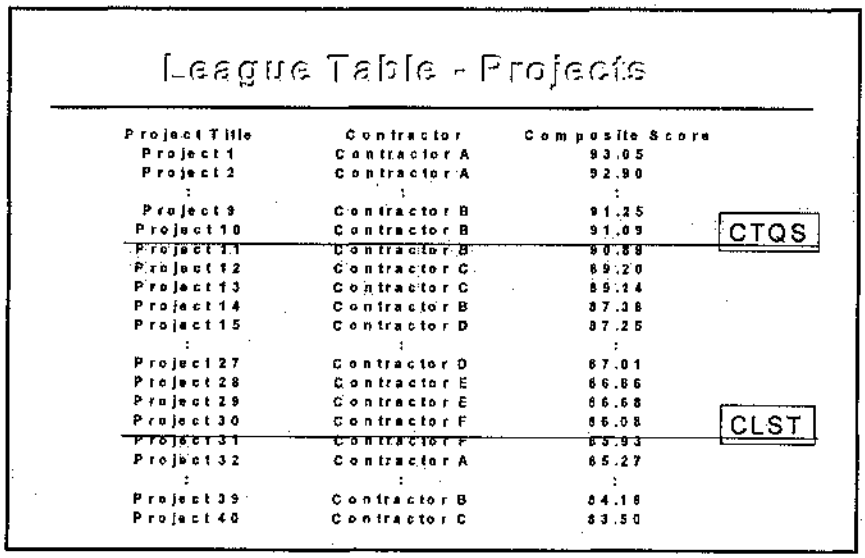
Under the current PASS system, scores collated over the quarter on individual projects are translated into project league. The project league reflects contractors' performance on individual projects. It triggers discussion of, or action on, poor performance of a contractor for a particular project. The League is categorized into three bands with two benchmark lines:

- Composite Target Quality Score (CTQS)
- Composite Lower Score Threshold (CLST)

CTQS is drawn at the upper quartile (25%) of the League. Projects fall in this band (the top band) above CTQS represents good quality projects.

CLST is drawn at the lower quartile (75%) and projects fall in the band below this line represents unsatisfactory projects. The contractors undertaking these projects would be subject to a review by CPRC on their performance. These contractors would receive an 'adverse' report. Subsequent disciplinary actions against them may then be taken.

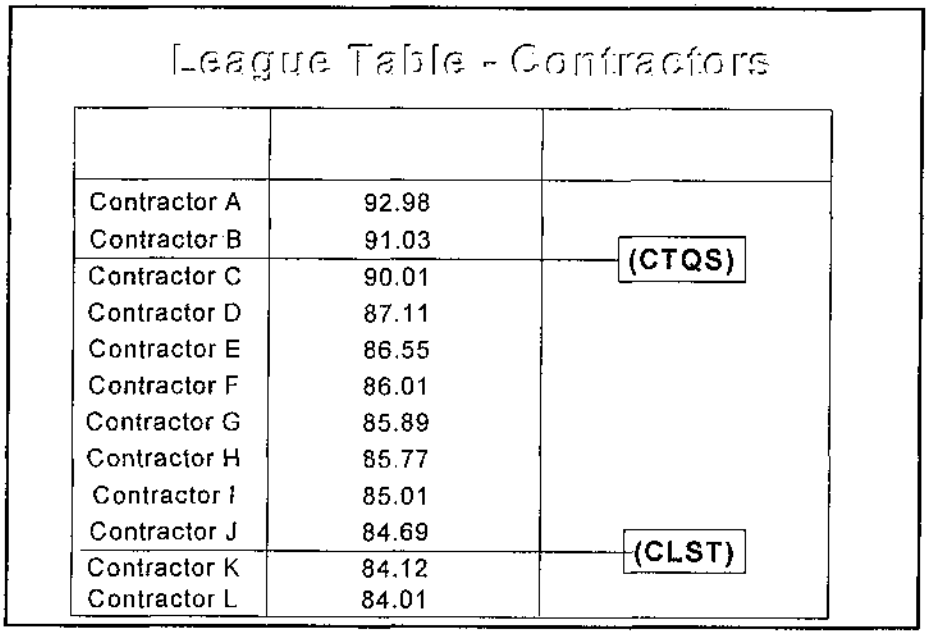
The pre-defined CTQS and CLST lines are superimposed onto the Contractors League. Higher tendering opportunity would be given to those contractors who fall in the upper band of this league (i. e. above the CTQS). These contractors will normally be invited to tender for all upcoming contracts in the next quarter, whereas contractors in the lower band i.e. below CLST, will not be invited to tender for the next quarter. Those contractors falling between CTQS and CLST will be given varying tendering opportunities, as decided by the LMC.



League Table - Projects

Project Title	Contractor	Composite Score	
Project 1	Contractor A	93.05	
Project 2	Contractor A	92.90	
:	:	:	
Project 9	Contractor B	91.25	
Project 10	Contractor B	91.09	CTQS
Project 11	Contractor B	90.89	
Project 12	Contractor C	89.20	
Project 13	Contractor C	89.14	
Project 14	Contractor B	87.38	
Project 15	Contractor D	87.25	
:	:	:	
Project 27	Contractor D	87.01	
Project 28	Contractor E	86.86	
Project 29	Contractor E	86.68	
Project 30	Contractor F	86.08	CLST
Project 31	Contractor F	85.93	
Project 32	Contractor A	85.27	
:	:	:	
Project 39	Contractor B	84.18	
Project 40	Contractor C	83.50	

Figure 4 - PASS 'Project-based' Score-league



League Table - Contractors

Contractor A	92.98	
Contractor B	91.03	(CTQS)
Contractor C	90.01	
Contractor D	87.11	
Contractor E	86.55	
Contractor F	86.01	
Contractor G	85.89	
Contractor H	85.77	
Contractor I	85.01	
Contractor J	84.69	(CLST)
Contractor K	84.12	
Contractor L	84.01	

Figure 5 - 'Company-based' Score-league

Over the years, although values of the CTQS and CLST have remained fairly constant as revealed under the project and contractors leagues, they are still subject to fluctuations at different stages of contracts and do not therefore provide a consistent basis for a pre-determined acceptance benchmark set by the Client for contractors to follow during construction. In PASS 2000, vigorous trial runs on on-going projects are being conducted so that meaningful benchmark standards can be established for use in lieu of the CLST:

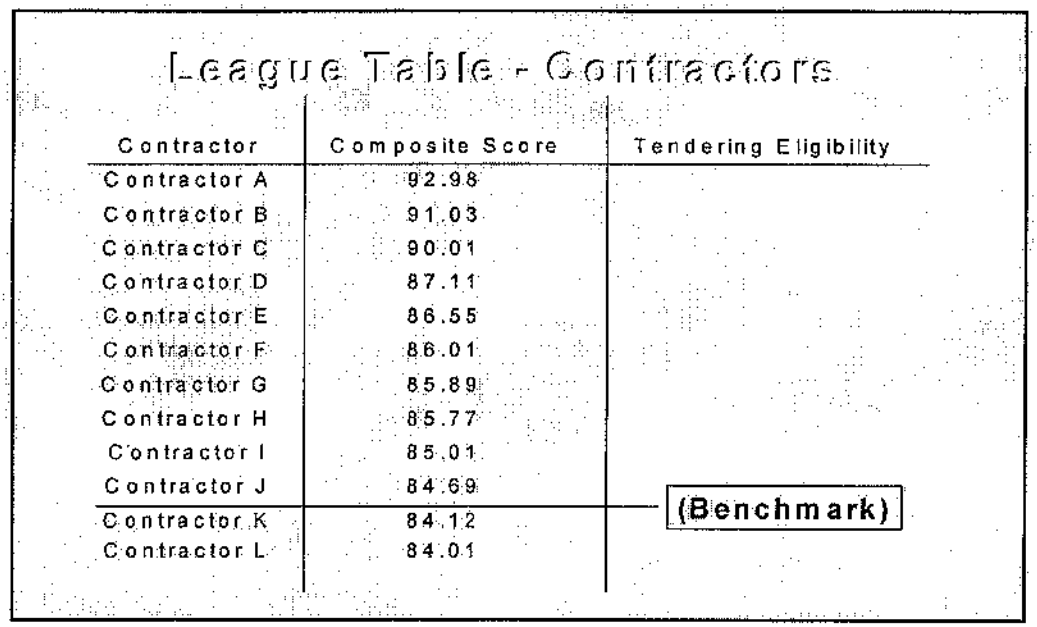


Figure 6 - 'Proposed Company-based' Score-league

It has always been the policy of the HA sample flat built at construction sites should represent the minimum acceptance standard for all projects. In PASS 2000, several rounds of benchmarking exercises have been carried out on different block-type sample flats, with the aim of taking the first step of setting a suitable benchmark for the Architectural Works (FINAL) Assessment, which is a main ingredient of the global benchmark in PASS 2000. The Architectural Works (FINAL) Assessment comprises the following 12 factors :-

Table 5 - PASS 2000 Architectural Works (Final) Assessment Factors

(AF-1)	Floor	**(AF-7)**	Components
(AF-2)	Internal Wall Finishes	**(AF-8)**	Precast Components
(AF-3)	External Wall Finishes	**(AF-9)**	Shop Front
(AF-4)	Ceiling	**(AF-10)**	Roads/Emergency Access (External Works)
(AF-5)	Windows	**(AF-11)**	Footpath/Pedestrian Areas (External Works)
(AF-6)	Plumbing	**(AF-12)**	Cleanliness and Care of the Finishing Works

The global benchmark will be used for the HD's incentive Bonus Scheme. Under the Bonus Scheme, the performance of a contractor in each project is compared with the global benchmark and companies will be paid a bonus if their Ultimate PASS Score is above the global benchmark. Payment of bonus is also subject to satisfactory performance on certain conditions under contract, such as completion on time, good site safety records and employment of qualified tradesmen and direct labour

Photographic records of acceptance standards and real samples have been identified, prepared and will be made assessable to all involved 'stakeholders'. This will be the first step to enable the Department to maintain consistency and assure suitable quality throughout all of its projects. A common target for building contractors, which is both appreciable physically and can be realistically achieved, will thus be established. Ultimately, there should be no ambiguity, or substantial deviation on workmanship and finishes standards due to misperception of, or speculation on, what the customer really desires.

Liaison with the Hong Kong Construction Association (HKCA) and the Construction Industry Training Association (CITA) on this issue is on-going.

CONCLUSIONS

Key objectives for PASS 2000 are elaborated to magnify the quality reforms laid down in the HD's "Quality Housing - Partnering for Change" document. They are seen as being the way forward for the Housing Authority and Department. It is anticipated significant gains can be made from implementing these quality tools, and that the amount of time and effort involved in developing them will be repaid many times over. Also running hand in hand with the PTAS and Bonus schemes, PASS is a means to ensure that contractors strive to continuously improve performance, progress and management input.

Benefits will include:
- Systematic control and monitoring over the progress and quality of construction projects
- Better understanding of the customer needs by contractors
- Fewer complaints and more satisfied customers
- Reduction in waste, quality problems and reworking
- A stronger reputation within their markets
- Catalyzing changes and improvements

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STRUCTURED ANALYSIS TO ENVIRONMENTAL IMPACTS OF CONSTRUCTION

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ABSTRACT

This paper adopts a structured approach to analyze the environmental impacts of construction. Existing research works have provided comprehensive literatures about the extents of environmental impacts from construction. Majority of these works focus on the classification of these impacts. Other works provide in-depth discussion from specific case studies. This paper provides an alternative approach for examining the environmental impacts of construction, which establishes the relation between environmental indicator and environmental by using matrix technique. A quantitative Indicator-Factor Matrix Model is formed to provide the possibility of assessing the construction's environment impacts in calculative terms.

Keywords: Environmental Performance Scoring System, Environment Impact, Construction, Matrix technique, Indicator-Factor Matrix Model, Fuzzy Comprehensive Assessment Technology

RESEARCH BACKGROUND

Any human activity will have an effect on the environment in certain way, and this effect can be a detrimental one. Best (1997) redeems that whilst the erection of permanent structures for residential and other purposes is one of the major attributes of civilization, the construction, maintenance and use of these structures all have significant impacts on the environment, both locally and globally. These impacts can produce effects in the short or long term; they may even contribute to irreversible changes in the world's climate, atmosphere and ecosystems. In fact, there is an increasing acceptance that global climate change is happening largely due to the human activity (IPCC, 1995). Building at all stages of their lives, from construction to demolition, contributes in many ways to the environmental effects. The significant environmental effects from developing construction projects has been increasingly attracting of research studies. Hall & Warm's survey (1995) shows that about 30% of the UK energy is used for housing and 20% for office.

Their study indicates that the majority of construction workers or building materials labors who suffer from dermatitis are due to the allergy to chromate used in building, as a trace impurity in all cements.

Virtually all-building materials have certain impact on the environment in their life cycle: from the extraction of minerals, to the disposal of demolished materials at the end of a building's life. In particular, environmental energy will be consumed for a wide range of construction activities, including extracting and transporting raw materials, to process materials, to fabricate components from the processed materials, to install components, and eventually to disassemble, or remove or demolish those components.

Environmental impact of processing and manufacture of course, the building materials are not restricted to energy consumption. It also includes physical degradation around mines, loss of topsoil, loss of forests, destruction of habitat, loss of biodiversity, and depletion of non-renewable resources such as mineral reserves and rainforests. Best (1997b) points out that manufacturing processes produce a variety of toxic and non-toxic wastes, many of which go to landfill or find their way into rivers and groundwater. On the other hand, on-site construction activities produce noise, dust and, sometimes, vibrations which may have significant, although generally short-term, local effects.

Solid waste produced during construction has traditionally been discarded and sent to landfill. This not only adds to the general problems of environmental pollution, but also increases the rate of land exhaustion. It is reported that about 14 million tones of waste put into landfill in Australia each year, 44% is from attributed to the construction/demolition industry (McDonald, 1996).

Logging which provides timber for building works has a devastating effect on forests. In tropical areas the pace forest of deforestation is alarming, and it is suggested that 42 million acres (approx. 17 million hectares) of forest disappear each year (Grant, 1996). Loss of water quality, destruction of habitat, degradation of soils and loss of species are some of the typical effects of forest devastation. Forests are a vital environmental element and a reduction in forest cover directly reduces the Earth's capacity of absorbing excess carbon dioxide.

Buildings are the major consumers of environmental energy. The building sector accounts for around one third of the delivered energy used in most countries, with an even greater portion of electricity use attributable to buildings. Janda and Busch (1994) estimate that 57% of electricity used in developed countries is consumed directly by buildings, of which 31% to residential buildings, and 26% to commercial buildings. The energy consumption for on-site construction activities becomes increasingly significant as building projects become more sophisticated. On-site construction activity requires electricity for tools, lighting, hoists and so on. Other mechanical items such as cranes and mixers use fossil fuels, which contribute directly to atmospheric pollution. Furthermore, for the operation of buildings, energy is used space heating and cooling, lighting, domestic hot water, and operating various appliances. Coal, natural gas and fuel oil are the major supply of the energy used, supplemented with renewable energy such as solar, wind and biomass. The process of using energy can produce significant amount of pollutions to the environment. In fact, burning coal to produce steam for electricity generation produces large amounts of greenhouse gases (GHG).

Research efforts have been devoted to investigate solutions for maximizing the protection of natural resources and minimizing the negative environmental impacts of the development of construction projects.

As a typical management system ISO 14000 has been developed for promoting environmental protection across all industries including construction. One of the standard in the system is ISO 14001, which has created a market-driven framework for balancing environmental protection with socio-economic needs that embodies the principles of sustainable development (Ofori, 1998).

However, the practice of ISO14000 is largely based on the establishment of a documentation system, which is similar to the practice of ISO9000 certification (HKPC, 1998; Ip, 2000). A typical limitation in the current practice in using the ISO14000 system in construction industry is that the construction firms' real environmental performance cannot be properly measured, and thus cannot be adequately communicated to the public or to construction clients (Shen and Zhang, 1999). This research team is investigating an alternative method applicable for measuring contractor's environmental performance, which is called Environmental Performance Scoring System (EPSS).

EPSS is designed to include a quantitative model for calculating the contractor's EPS, and guidelines for determining the values of variables/parameters built into the EPSS model. The Performance Assessment Scoring System (PASS) adopted by Hong Kong Housing Authority (HKHA) provides an

example of measuring contractors performance. But PASS is used to measure the quality (HKHA, 1996). The quantitative model will involve various indicators and factors that can measure and define the environmental performance. It is considered essential to properly identify and establish these environmental factors and indicators in order to develop and effective measurement model. It is the major objective of this paper to develop a method that allows the environmental factors and indicators in construction business can be properly identified and presented. This paper provides the foundation of developing the EPSS at next stage of this study.

EXISTING RESEARCH METHODS FOR ANALYZING THE ENVIRONMENTAL FACTORS AND ENVIRONMENTAL PERFORMANCE INDICATORS

The FRANCE CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT (FRANCE CSTB) adopted a Mutli-Dimension Analysis Matrix to analyze the environmental impact and the relationship among the various environmental factors through the Life Cycle Phases (CIB Report, 1997a). This format is presented with three dimensions:

Ecological principles (six principles are defined in the construction field in order to meet the three basic goals of a Sustainable Development: to eliminate resource depletion; to eliminate environmental degradation, and to create a healthy interior and exterior environment),
- Resources (four resources are concerned: land, energy, water and materials)
- Life cycle phases of the construction process (five phases are defined: develop and plan, design, construct, operate, deconstruct).

The FRANCE CSTB's a Mutli-Dimension Analysis Matrix provides a very comprehensive assessment methodology, but it does not provide the operation procedures in quantitative terms.

The Dutch government together with other organizations sponsored the development of Eco-QuaNtum (EQ) (CIB Report, 1997b) for providing architects and project developers with an instrument to measure the environmental performance of buildings. EQ is a calculating method on the basis of Life Cycle Analysis (LCA). The environmental effects during the entire life cycle of the building are taken into account, from the extraction of raw materials to the final demolition or reuse. EQ also takes into account the possibility for selective demolition or renovation. The method can be used for both dwellings and non-domestic buildings.

Tom Woolley (1997) proposed an 'easy-to-read' format which summarizes the environmental impact of construction product. There is a sample about this form: Figure 1: 'Environmental Impact Analysis of Materials', which is listed below.

In the figure, a circle in a column indicates the degree of environmental impact in a particular aspect. The larger the circle the worse an environmental impact is thought to be.

Life Cycle or 'cradle-to-grave' analysis of a product's environmental impact requests the consideration to all parts of a product's life, namely, extraction, production, distribution, use and disposal. The Green Building Handbook's Product Tables (GBHPT) provides reference of how to group these factors and environmental impacts (Woolley, 1997).

In the application of GBHPT, the key environmental impacts are rated on a scale from zero to 4 under each impact category. A blank represents a zero score, meaning that there is no evidence of significant impact in this category. The following symbols represent the impact scale.

Although GBHPT approach only analyzes the materials environmental impact through LCA Rating Method, this method provides good reference for developing a method of assessing contractor's

environmental performance. An alternative for such purpose can be an environmental performance scoring system (EPSS).

EPSS is considered being able to measure contractor's environmental performance diagnose the causes of thus to encourage the construction industry to adopt environmentally efficient technologies and management methods. By doing in such quantitative approach, contractor's performance can be compared and recorded. They also can be built into the contactor pre-qualification and bid evaluation systems.

Figure 1: 'Environmental Impact Analysis of Materials'

	Production										**Use**					
	Unit Price Multiplier	**nergy Use**	**esource Depletion (bio)**	**esource Depletion (non-bio)**	**Global warming**	**zone Depletion**	**Toxics**	**cid Rain**	**hotochemical Oxidants**	**Other**	**nergy Use**	**urability/Maintenance**	**ecycling/Reuse/Disposal**	**ealth**	**ther**	**ALERT!**
Bricks																
Ordinary clay	1.0	●					◎	◎	◎	◎						
Flettons	0.8	•					@	●	•	●						
Soft Mud/Stocks	1.0	@					◎	◎	◎	◎						
Perforated clay	1.0	◎					•	•	◎	•						
Calcium-Silicate	0.9	●		◎	◎		◎	◎	◎	●						CFCs?
Re-Used	1.4															
Concrete Blocks																
Ordinary Dense blocks	0.3	◎	•	●	@		●	◎	◎	●						
Lightweight Aggregate	?	◎	•	◎	@		●	◎	◎	@				@		
Aerated	3.2	@	•	•	◎		●	◎	◎	●						
Composite Insulating	1.4	◎	•	●	@	@	●	◎	◎	●						
Stone																
Local	3.2									◎						
Imported	?	◎								◎						
Reclaimed	3.2															
Artificial	1.4	◎	•	●	@		●	◎	◎	●						
Mortar Ingredients																
Ordinary Portland Cement	N/a	@						◎	◎	●			•	◎		Haz. Waste
Pure Lime	N/a	●			@		◎	◎	•	●				◎		
Hydraulic Lime	N/a	●			●		◎	◎	•	●				◎		
OP Blastfurnace Cement	N/a	◎		•	◎		•	•	•	•			•	◎		
OP Pulverised Fuel Ash	N/a	◎		•	◎		◎	•	•	•			•	◎		
Masonry Cement	N/a	●		•	●		◎	•	•	●			•	•		
Sand and Gravel	N/a		•	●												

@ ... Worst or biggest impact
● ... Next biggest impact
◎ ... Lesser impact
• ... Smaller but significant impact
[Blank] no significant impact

The key issue of EPSS will be the calculation of environmental performance score (EPS). This paper proposes a 'Mutli-Hierarchy Matrix Method (MAMM)' for the calculation of EPS. The process of calculating EPS can be presented with a flow chart as shown in Figure 2: General Structure of EPSS.

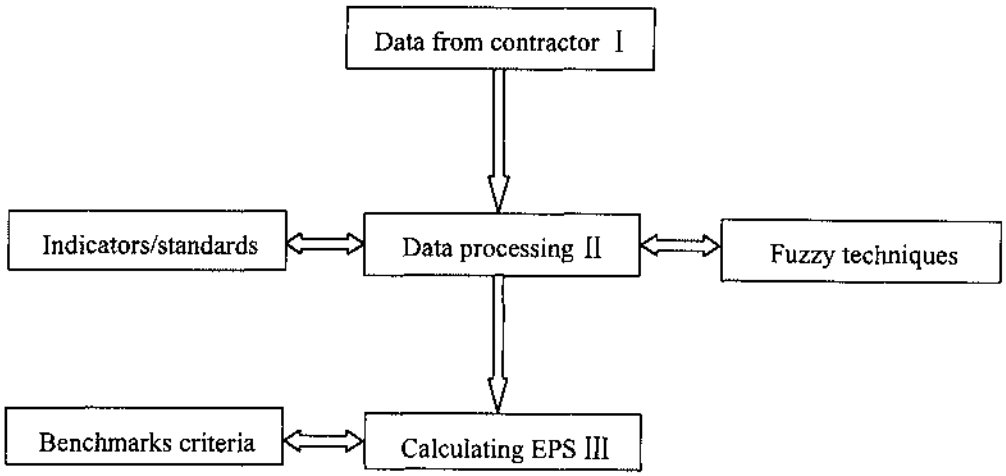


Figure 2: Flow Chart of EPS Calculation

The important aspects of MAMM include the identifications of environmental factors and indicators of construction, the establishment of benchmarks and criteria, and the data processing. The research work in this part focuses on the proper establishment of environmental factors and indicators. In the next stage, the research team will investigate the benchmarks and criteria. Existing systems such as the PASS, ISO14000 and literatures on environment management system, together with conducting practical survey, will be used for the undertaking of the work.

STRUCTURING THE ENVIRONMENTAL INDICATORS FOR EPSS

Previous research works have investigated various kinds of environmental indicators, and a typical lost of indicators include (Wu and Shen, 2000).

The structure of indicators is listed in Table 1: 'Structure of tentative indicators of Environment Impact'

Table 1: Structure of tentative indicators of Environment Impact

1st level indicator	2nd level indicator
Natural impact (NI)(I_1)	Acid rain (I_{1-1})
	Photochemical pollution (I_{1-2})
	Particulate (I_{1-3})
	Global warming (I_{1-4})
	Ozone depletion (I_{1-5})
	Pollution (Air, land, water or noise) (I_{1-6})
	Toxics (I_{1-7})
	Waste (I_{1-8})
Energy & resource impact (ERI)(I_2)	Energy use (I_{2-1})
	Resource depletion (bio or non-bio) (I_{2-2})
	Thermal performance (I_{2-3})
Sustainability impact (STI)(I_3)	Usage of recycled materials (I_{3-1})
	Usage of renewable materials and energy (I_{3-2})
	Reusing of the materials (I_{3-3})
	Maintenance of materials (I_{3-4})
Social impact (SI)(I_4)	Site polite construction (I_{4-1})
	Community communication (I_{4-2})
Human impact (HI)(I_5)	Health hazard (I_{5-1})
	Occupation health (I_{5-2})

In order to develop a quantitative model, it is necessary to symbolize parameters of indicators and factors. Both indicators and factors are structured in hierarchy. The variable of indicator is symbolized with 'I'. By referring the table, the 1st level indicator is defined as I_i(i=1,2, ... 5); the 2nd level indicator is defined as $I_{i-i'}$(i=1,2, ... 5;), and

$i' \in \Phi$), and

$$\Phi = \begin{cases} i' = (1,2,\text{K } 8) & i = 1 \\ i' = (1,2,3) & i = 2 \\ i' = (1,2,3,4) & i = 3 \\ i' = (1,2) & i = 4 \\ i' = (1,2) & i = 5 \end{cases} \qquad \text{------(1)}$$

Thus, the value of i' will be subject to Φ which is a function of i.

STRUCTURING THE ENVIRONMENTAL FACTORS FOR EPSS

Whilst there are many classifications on environmental factors, a typical list can be summarized in Table 2.

Table 2: Classification of environmental factors

1st level factor (F_j)	2nd level factor ($F_{j-j'}$)	3rd level factor ($F_{j-j'-j''}$)
Specific works(SFW)(F_1)	Structural works (SW)(F_{1-1})	Earthwork and excavation(F_{1-1-1})
		Formwork and formation(F_{1-1-2})
		Reinforcement(F_{1-1-3})
		Concrete(F_{1-1-4})
		Waste treatment(F_{1-1-5})
	Architecture works (AW)(F_{1-2})	Wall, roofing and isolation(F_{1-2-1})
		Component installment(F_{1-2-2})
		Plumbing and drainage(F_{1-2-3})
		Ornament and painting(F_{1-2-4})
		Surrounding landscaping(F_{1-2-5})
		Waste treatment(F_{1-2-6})
Other obligations(OO) (F_2)	Site management (SM)(F_{2-1})	Site security (F_{2-1-1})
		Material storage and security(F_{2-1-2})
		Cleanliness and care of the finished works(F_{2-1-3})
	Health & block safety(HBS)(F_{2-2})	Health & other provision(F_{2-2-1})
		Block related safety(F_{2-2-2})
Management system (MS)(F_3)	Management & organization works (MOW)(F_{3-1})	Management structure(F_{3-1-1})
		Site planning(F_{3-1-2})
	Resources(F_{3-2})	Labor(F_{3-2-1})
		Plant(F_{3-2-2})
		Materials(F_{3-2-3})
	Co-ordination & control(F_{3-3})	Co-ordination(F_{3-3-1})
		Control and supervision(F_{3-3-2})
		Co-operation(F_{3-3-3})
	Documentation(F_{3-4})	Submission(F_{3-4-1})
		Environment report(F_{3-4-2})
Schedule control (F_4)	Programming & progress(F_{4-1})	Programme(F_{4-1-1})
		Progress(F_{4-1-2})
		Milestone(F_{4-1-3})

These factors are symbolized with a hierarchy. The variable of factor is symbolized with 'F'. The 1st level factor is defined as $F_j(j=1, 2...4)$; 2nd level factor is defined as

$$F_{j\sim j'}\ (j=1, 2\ldots4;\ j'\in\Gamma) \text{ and}$$

$$\Gamma=\begin{cases} j'=(1,2) & j=1 \\ j'=(1,2) & j=2 \\ j'=(1,2\Lambda\ 4) & j=3 \\ j'=1 & j=4 \end{cases} \qquad \text{------(2)}$$

The specific value of j' is determined by Γ which is function of j.

The 3rd level factor is defined as $F_{j-j'-j''}\ (j=1, 2\ldots4;\ j'\in\Gamma;\ j''\in\Psi)$ and

$$\Psi=\begin{cases} j''=(1,2\Lambda\ 5) & j=1 & j'=1 \\ j''=(1,2\Lambda\ 6) & j=1 & j'=2 \\ j''=(1,2,3) & j=2 & j'=1 \\ j''=(1,2) & j=2 & j'=2 \\ j''=(1,2) & j=3 & j'=1 \\ j''=(1,2,3) & j=3 & j'=2 \\ j''=(1,2,3) & j=3 & j'=3 \\ j''=(1,2) & j=3 & j'=4 \\ j''=(1,2,3) & j=4 & j'=1 \end{cases} \qquad \text{------(3)}$$

The specific value of j' is defined by Γ which is function of j, and j'' is determined by Ψ which is function of j'.

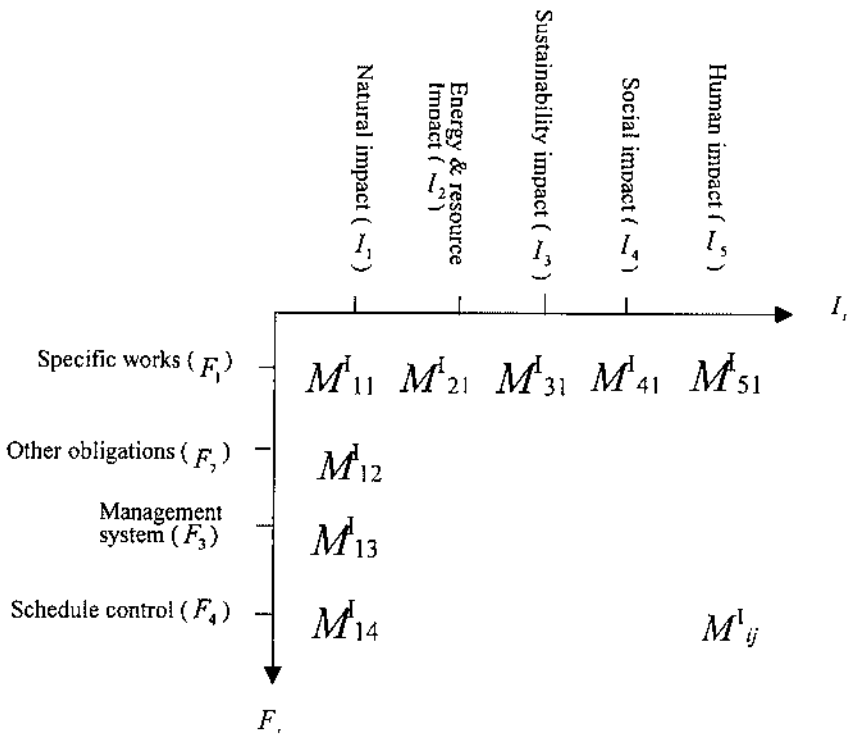
DEVELOPMENT OF INDICATOR-FACTOR MATRIX

It is considered that the significance of indicators should be examined with considering the environmental factors. Therefore, it is important to establish the relevance between indicators and factor. Matrix method is considered as an effective alternative for this purpose. As both indicators and factors are classified in hierarchy, the relevance between indicators and factors are examined at different levels of matrix.

(1) The 1st level Indicator-Factor Matrix (M_{ij}^1)

In previous section, the environmental factors are grouped with three levels and the indicators are designed with two levels, thus there will be three levels of matrix for examining their relevance.

Let horizontal axes represents for environmental indicator, and vertical axes for environmental factor. Therefore at the first level of matrix there are four elements or variables on vertical axes, namely, F_1, F_2, F_3 and F_4. They represent respectively for specific works, other obligations, management systems and schedule control. The vertical axes are presented as indicators of environmental impact I_i. On the horizontal axes, there are five variables (indicators), which are I_1, I_2, I_3, I_4 and I_5, and they represent respectively for natural impact, energy & resource impact, sustainability impact, social impact and human impact. When the two dimensions are placed in a matrix in Figure 3 can be obtained.



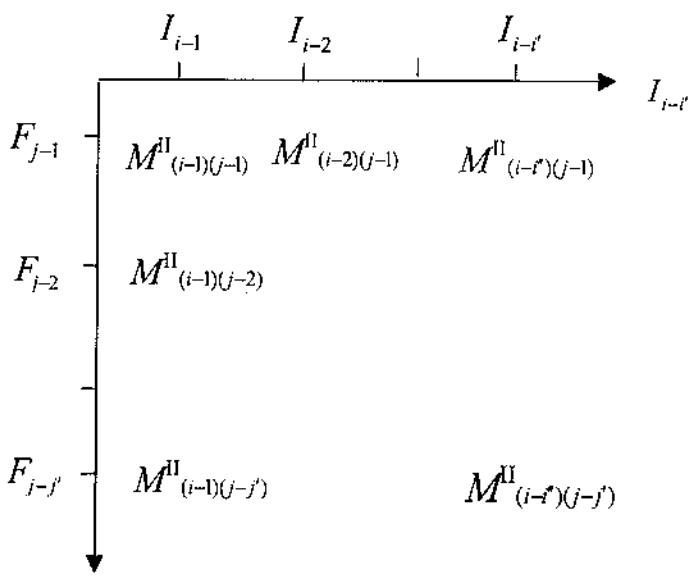
The corresponding relationship between the factor F_j and the indicator I_i are presented with the symbol M^{I}_{ij}, which can be defined as 1st level indicator-factor matrix. This relation can be assessed with a value or presented with a further level matrix if F_j or I_i is still to be divided to further level of elements. And the further level matrix can be described as 2nd level indicator-factor matrix.

The value of M^{I}_{ij} is defined by the variables F_j and I_i, which can be written as:

M^{I}_{ij} (i=1,2...5; j=1,2...4)= $_f(I_i,F_j)$(i=1,2...5; j=1,2...4)

(2) The 2nd level Indicator-Factor Matrix ($M^{II}_{(i-i')(j-j')}$)

In order to examine the relevance of the 2nd level factors and 2nd level indicators, the matrix model shown in Figure 4 can be developed $M^{II}_{(i-i')(j-j')}$, and this can be called 2nd level indicator-factor matrix.



The vertical axes in the figure 4 presents 2nd level factors $F_{j\text{-}j'}$ that are leveled down from the related 1st level factors. By referring to Table 2, the value of j is from 1 to 4, the j' is a function of j, which is described as that $j' \in \Gamma$ defined in formula (2).

The horizontal axes in Figure 4 presents the 2nd level indicators of environment impact, denoted as $I_{i\text{-}i'}$:

Where i=1,2,3,4,5

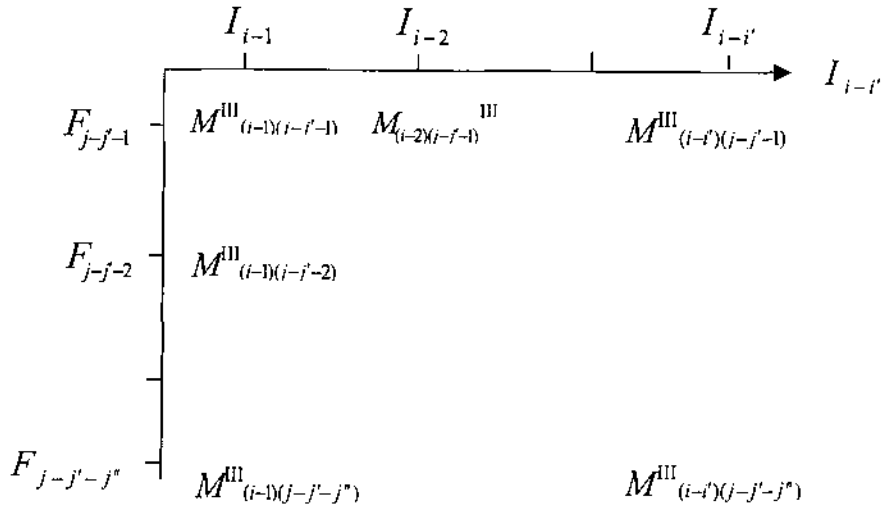
i' is a function of i, which is described as that $i' \in \Phi$ defined in formula (1).

The value of variable $M^{II}_{(i\text{-}i')(j\text{-}j')}$ is determined by $I_{i\text{-}i'}$ and $F_{j\text{-}j'}$, which can be written as:

$M^{II}_{(i\text{-}i')(j\text{-}j')}=f(I_{i\text{-}i'},F_{j\text{-}j'})(i=1,2...5; i' \in \Phi; j=1,2...4; j' \in \Gamma)$

(3) The 3rd level Indicator-Factor Matrix ($M^{III}_{(i\text{-}i')(j\text{-}j'\text{-}j'')}$)

In order to examine the relevance of the 3rd level factors and the 2nd level indicators, the matrix model $M^{III}_{(i\text{-}i')(j\text{-}j'\text{-}j'')}$ is developed, as shown in Figure 5.



The value of the variable $M^{III}_{(i\text{-}i')(j\text{-}j'\text{-}j'')}$ will be determined by the relevant variables $I_{i\text{-}i'}$ and $F_{j\text{-}j'\text{-}j''}$. $I_{i\text{-}i'}$ and $F_{j\text{-}j'\text{-}j''}$ are not divided into further elements. Thus it is important to examine their values. In practice, this can be done through the evaluation of factors in the construction stage determined by expertise, the relative literature, statistics data processed from the questionnaires. Therefore,

$M^{III}_{(i\text{-}i')(j\text{-}j'\text{-}j'')}=f(I_{i\text{-}i'},F_{j\text{-}j'\text{-}j''})$

$(i=1,2,3,4,5; i' \in \Phi; j=1,2,3,4; j' \in \Gamma'; j'' \in \Psi)$

Φ, Γ'and Ψ are defined respectively in formula (1), (2) and (3).

CONCLUSIONS

The application of the Matrix model will be investigated in detail in next stage of the study. In principle, the backward approach will be adopted in the application, which will include the following procedures:

- To determine the specific value of the variable $M^{III}_{(i-i')(j-j')(j-j'')}$ at the 3rd level matrix through various ways such as formal standards, literature findings, survey, fuzzy method for converting qualitative data.
- To decide the 3rd level weighting coefficients to various 2nd level indicator and the various 3rd level factor. This can be done through carrying out reviews and surveys.
- To calculate the specific value of the variable $M^{II}_{(i-i')(j-j')}$ of the 2nd level matrix by using the value $M^{III}_{(i-i')(j-j')(j-j'')}$.
- To determine the 2nd level weighting coefficients to the 2nd level indicators and the 2nd level factors;
- To calculate the value of the variable M^{I}_{ij} at 1st level matrix by applying the value of at 2nd level matrix.
- To determine the 1st level weighting coefficients to 1st level indictors and the 1st level factors.
- To get the final value of the variable .
- The value of M^{I}_{ij} will be used as the basis of EPS. The related weighting coefficients are important and they will be determined with incorporating the expertise and literature findings.

This paper presents a three-level Indicator-Factor Matrix Model for examining the relevance between environmental factors and the indicators of environmental impacts. The model provides a quantitative means in analyzing the construction's environmental performance by calculating an integrated score. As the composition of both indicators and factors are very complicated, it is essential to establish proper and clear relevance between them, and the matrix model developed in this paper provides an alternative for such purpose. This development provides important basis for developing the EPSS at next stage of this study. The development pf EPSS provides construction industry with an effective tool to monitor the contractor's environmental performance.

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THE DEVELOPMENT OF PROJECT MANAGEMENT IN CHINA'S CONSTRUCTION INDUSTRY

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ABSTRACT

This paper presents an overview of the development of project management in China's construction industry. It first gives the notion of project management as defined by CIOB and the background of China's construction industry, followed by an account of its introduction into China by scholars in the academic circles. Then it examines its application in China's construction projects, particularly in some major infrastructure projects. Thereafter, the legal environment is depicted regarding project management in China. Finally, the framework of China's project management is detailed, with a brief mention of the current academic research status on project management as a conclusion.

Keywords: China construction industry, procurement, project management

BACKGROUND OF CHINA'S CONSTRUCTON INDUSTRY

Project management, as an emergent professional discipline, has a long history, but in its modern form only dates back for about 30 years and is defined by CIOB (1996) as " the overall planning, coordination and control of a project from inception to completion aimed at meeting a Client's requirements in order to produce a functionally and financially viable project that will be completed on time, within authorized cost and to the required quality standards."

For many years before the early 1980s, the construction industry in China was controlled by the Government as a result of its policy of a centrally planned economy. Almost all the construction projects were financed by the Government, designed by state-owned design institutes, and built by state-owned construction enterprises (Mayo and Liu 1995). Throughout the whole construction/ development process, the management was through administrative orders and the budget was decided by the Standard Norms published by the Central Government authorities. The burcaucratic system, combined with the poor management skills of the construction enterprises resulted in unsatisfactory implementation of the construction projects, particularly in terms of substantial cost overruns and late completion.

PROJECT MANAGEMENT IN PRACTICE

Project management was introduced into China's construction industry since China's adoption of reform and open policy in the early 1980s. Some foreign experts and returned Chinese scholars came to China to lecture on project management, for instance, Mr. J.A. Bing, who ran a training seminar sponsored by the Commission of Economy of China in 1982, and Professor Ding Shizhao of Tongji

University, who took great initiative to promulgate the application of project management in China. In 1983, he lectured on project management in a seminar sponsored by the Academic Society of Construction Economics in China and recommended the application of such management methodology in China's construction industry. Professor He Bosen of Tianjin University advocated project management from the perspective of the Chinese contractors involved in international projects and sponsored a series of international project management programmes in Tianjin University. Since then, education and study of project management began in China's universities. Tianjin University took the lead in offering such a course to undergraduates and published the textbook of Construction Project Management in 1988. China Oil University translated into Chinese and published Project Management and Organizational Behavior. By the early 1990s, Fudan University offered the course in project management to its undergraduates and postgraduates. Thereafter, several universities followed suit.

Meanwhile, project management began to be applied in China's construction projects, such as Lubuge Hydropower Project in 1984, which was financed by the International Bank of Reconstruction and Development (IBRD) through the Ministry of Finance and was awarded through international competitive bidding. The successful application of project management in this project reduced the costs and shortened the construction period, showing its great advantage and drawing the attention of the Chinese construction industry.

With China's fast economic growth in the late 1980s and early 1990s, huge investments have been made in construction projects, including infrastructure and industrial projects, which were large and complex in scope, structure and technology, thus demanding the new mode of project management in construction. In 1987, five government authorities, including the State Planning Commission, issued a joint notice to advocate the pilot application of project management in some construction projects. In 1991, the Ministry of Construction issued decrees to call on the full-scale application of project management in the construction industry, as a further reform of China's construction industry. Thereafter, the Ministry of Construction, the Ministry of Electricity, the Ministry of Chemical Engineering, the Ministry of Communications, the Ministry of Water Resources and the Ministry of Coal sponsored various training programs and seminars on project management for their respective construction project teams that participated in the ministries' projects as clients, contractors and consulting engineers. Some ministries implemented a project manager certification system through various tests. Focusing on IBRD-financed projects, the Ministry of Finance also held many training programs for project managers in collaboration with the World Bank.

LEGAL FRAMEWORK FOR PROJECT MANAGEMENT

With the continuous education and practice of project management in China's construction industry, corresponding legislation has been formulated. In August 1983, the State Council issued two legal documents: Regulations on Survey and Design for Construction Projects and Regulations on Contracting for Building and Erection Works. In 1993, the Ministry of Construction issued Management Rules for Construction Contracts. Based on the above legal documents and other relevant laws since 1991, the Ministry of Construction, in collaboration with the State Administrative Bureau of Industry and Commerce, published a series of model documents, including Model Contract Form for Construction, Model Contract Form for Supervision/Consultancy of Construction Projects, Model Contract Form for Design of Construction Project, Model Contract Form for Building Decoration Works, all of which were recommended for use nationwide. In addition, the Ministry is also preparing other models forms of contract, such as Model Contract for Turnkey Projects and Model Subcontract for Construction. Other ministries, such as the Ministry of Water Resources and the Ministries of Communications, prepared Standard Documents of Procurement of Works to be applied in their respective projects. All these help to develop the project management system in China.

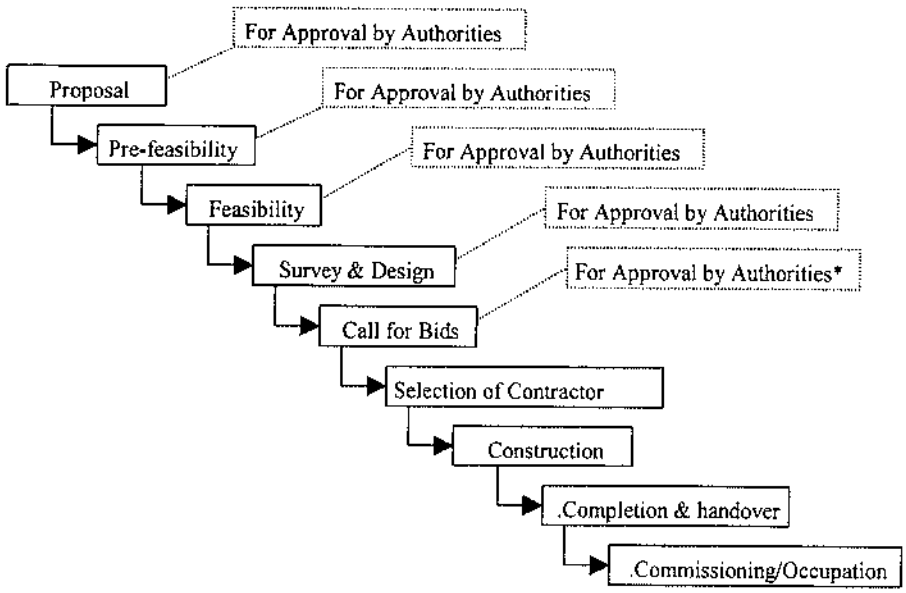
In recent years, with further reform in the construction industry, four systems have been developed: Client's Responsibility System, Tendering/Bidding System, Construction Supervision/Consulting System, Contracting System. The three newly published laws, namely, Building Law (published and adopted in 1998), Contract Law (published and adopted in 1999) and Tendering/Bidding Law (published and adopted in 2000), have provided a good legal environment and foundation for implementing project management in China. Based on these laws, the Ministry of Construction is now organizing to prepare two codes: Code of Construction Project Management and Code of Construction Supervision/ Consultancy.

PROJECT MANAGEMENT FRAMEWORK IN CHINA

At the present stage in the world construction industry, project management is not just focused on the construction phase, but involved in the whole project development process, including such areas as identification/inception, feasibility study, financing, design, tendering, construction and even operation. It can be classified into two levels in China: the Client Level and the Contractor (construction enterprise) level. The Client Project Management/development process is seen in Figure 1.

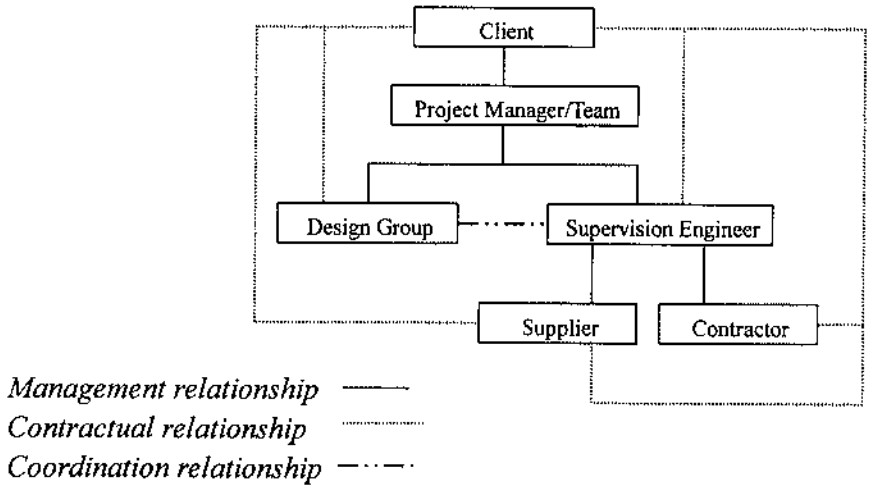
Although project supervision system is being practiced in China, it is of some difference from project management. The supervision system focuses mainly on the construction stage while project management is applied throughout the whole project development process. The Supervision Engineer (see Figure 2) is engaged by the Client's project management team to manage the Contractor during the construction stage.

Figure 1 Client Project Management Procedure



* In accordance with China's Tendering Law, the Client shall report to the government authorities for approval of procurement strategy before calling for tenders if the project for which tenders are called is a major one.

Figure 2 Client's Project Team Organization



The client (usually a ministry or a national investment corporation), after having decided to develop a project, builds up its own project management team by first appointing a project manager, who is put in charge of the project with necessary and sometimes, full authorization. The project manager is authorized to form the project team. The personnel of this team usually come from the subsidiaries of the Client organisation and are made up of professionals, such as budget engineers, progress planners and quality engineers. For major projects, the project management team often evolves into a company that operates the completed project during the operation stage. The common duties of such project management team/manager are as follows:

At Pre-tender Stage:
- Preparing project brief (development procedure)
- Selecting consultants to conduct feasibility study
- Selecting consultants to prepare project brief
- Preparing or selecting consultants to prepare cost budget
- Land acquisition planning
- Selecting and coordinating with design team
- Selecting supervision engineer

At Tender Stage
- Develop contract strategy
- Prepare tender documents with the help of consultants
- Organize to prequalify tenderers
- Issue tender documents to prequalified tenderers
- Organize to evaluate tenders
- Award the contract to the successful tenderer

At pre-construction stage
- Acquiring the land for construction
- Coordinating with design team for producing drawings
- Coordinating with the antique department
- Apply for approval/permit from competent authorities to commence the work
- Establish project control system

At Construction Stage
- Coordinating with local authorities
- Monitoring the execution process
- Arranging/attending weekly and monthly meetings

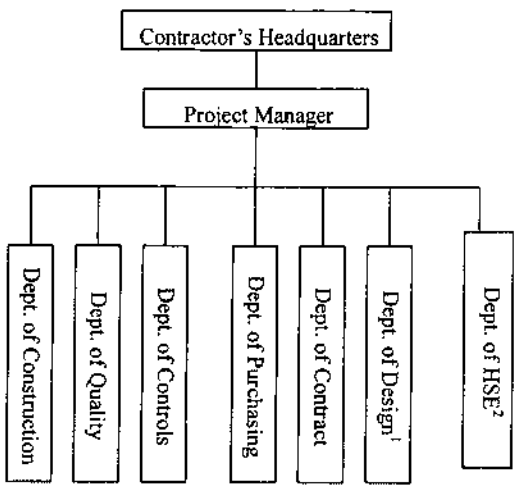
- Coordinating with design team
- Coordinating with Supervision Engineer
- Regular inspection of site activities
- Approving variations and claims*
- Approving and making payment*
- Participating in tests on completion
- Taking over project when completed

* In practice, the Client Project Team/Management usually retains the authority to approve payment, variations and claims. The Supervision Engineer is seldom granted such authority.

After the contractor is awarded the contract, the tendering team often evolves into the contractor's project team with the project manager being in full charge of the whole project. Such project team is a temporary organization, with its sole aim to fulfill the contractor's contractual obligations and execute the project under the leadership of the contractor's project manager. The contractor project manager is authorized to be wholly responsible for the project execution in terms of project quality, progress and cost.

At present, the contractor-level project management system, though not in total uniform, is being conducted in almost all construction projects in China, particularly in the prominent major construction projects, such as The Three Gorges Hydro project, The Wanjiazai Water Diversion Project, The Xiaolangdi Hydro Project, and the China East-to-West Gas Transportation Project.

Figure 3 Contractor's Project Organization



[1] This department exists only in case of a design & build or an engineer-procure-construct (EPC) project.
[2] HSE stands for health, safety and environment.

CONCLUSIONS

In recent years, the Chinese academia has conducted further studies of project management, expanding from the project management procedures and techniques, such as Three Controls (ie. cost control, time control and quality control) to project management organization design and leadership study. With the advent of China's entry into WTO, the Chinese Government is expediting its pace to adopt project management practice. Many research projects are being entrusted to and conducted by some of the renowned universities in China for this purpose. Relevant ministries, such as the Ministry of Construction, the academic circle and relevant project management associations, are making joint efforts to establish standard codes of project management in China. There have been frequent visits to

the overseas counterparts in order to exchange experience with regard to project management practice. Relevant codes to guide China's project management practice in the construction industry are under preparation and publication.

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DEVELOPING STRATEGIES FOR IMPROVING OWNERS' INVESTMENT AND CONTRACTING PROCEDURES IN A CONSTRUCTION PROJECT

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ABSTRACT

This paper provides a framework for improving owners' investment and contracting strategies by analysing US, UK, and Japanese contracting practices. The aim is to intertwine the similarities, differences, positive and negative attributes in form of a comparison, in order to develop a better strategic contractual approach on owner's contracting investment. This paper concludes by suggesting four-core strategic framework; (i) Users/Customer; (ii) Financial; (iii) Internal Construction Process and (iv) Feedback and Learning framework for improving owners' investment and contracting strategies, in order to reduce owner's investment and risk and to improve the quality of the project.

Keywords: cost management, feedback, developers, development budget, and procurement

INTRODUCTION

The eternal triangle of construction is made up of three parties as the main participants, the owner, designers, and contractor (Ashworth 1991). Cox and Townsend (1998) make a comparison of international procurement, among the highlighted differences are markets, industry structure and characteristics, and supply chain characteristics. Male & Mitrovic (1999) postulate that the mature construction markets of Europe, Japan, and the US and increasing global competition have influenced the business practice of major owners to construction. This has resulted to outsourcing of non-core activities through the establishment of sourcing alliances. The overall effect is the emergence of new contracting system in different contracting practices. The aim of this paper is to develop strategies in improving owners' investment in a construction project via literature survey. US, UK and Japanese practices has been used as a frame of references because of their construction demands and outputs. The themes for comparison starts from nature of the construction industry through contracting and construction processes with emphasise on cost and project management, and dispute resolution methods. The results are tabulated inform of a comparison and as a positive and negative attributes to identify what is better in each practice and its resultant effect from owner context. The positive and negative attributes serve as a reference point in drawing the framework but not directly connected. The four suggested framework will improve the way in which construction demand chain is been arrived at and supply chain been managed. It will also assist owner in obtaining real value for his money and cause minimum disruption and less dispute in project execution.

Contracting systems of UK, US and Japan

British contracting system

National Economic Development Office (NEDO) faster building for commerce analysed the problem of industry structure and argued that the proliferation of organisations and specialisms has aggravated the existing problems of co-ordination, communication, motivation and control (Cox and Townsend 1998). Cox and Townsend (1998) referring to CIB Working Group 11 (1996) explains that the construction supply chain has become increasingly fragmented, as each component has become less trusting, more self-interested and adversarial. By this, each party attempts to pass risks down to the next layer in the supply chain in order to minimise their own exposure. It is generally acceptable that the structures of traditional construction supply chains are fragmented and dysfunctional, with too many 'non value-adding' costs.

With the creation of the Construction Clients' Forum (CCF) and the Construction Round Table (CRT), the demand side of the industry has becomes less fragmented. The supply side of the industry continues to be fragmented both in terms of the professions and the constructors. The architectural, structural, services engineering and cost management field are entirely different and belong to different discipline (Cox and Townsend 1998). Therefore, the power between the stakeholders is balanced through the use of third party cost checking and the provisions in the condition of contracts and statutory laws. For instance, in the Joint Contracts Tribunal (JCT 80) condition of contracts, the architect is empowered to issue oral and written instruction to the contractor (clause 4.3), while the contractor may also challenge the architect's authority by requesting the architect to specify in writing the provision in the contract, which empowers the issue of the particular instruction clause 4.2.

Chua et al., (1999) emphasised that plans and technical specifications contained in the contract document generally provide the basis for contractors' tender price as well as resources procurement and allocation strategy. Plans and specifications also delineate client's expectation with respect to the quality of the final product. According to Seeley (1997) the procurement systems nowadays can be categorised under four headings: lump sum either sequential or accelerated; design and build either direct, competitive or develop and construct; design and manage either by contractor or consultant; fee construction i.e. management method either management contracting or construction management. The choice of contract procurement will start from design stage, when the architect/consultants or the contractor is responsible for the design and/or build of the project. Ashworth (1991) highlights the merits and demerits of engaging a consultant rather than a contractor as the main employer's adviser versus contractor-centred approach.

In construction tendering procedure has been one of the ways of determining contract price. This price can be determined after open or selective tendering exercise, alternatively the client or his consultants could by-pass tender stage by approaching a contractor and negotiate the contract price. In the open or selective tendering exercise, the lowest tender is then asked to submit his priced bill of quantities within four working days, unless it has been submitted with the tender (Pheng 1996). The examination of priced bills should be undertaken by the quantity surveyor who must treat the document as confidential between himself, the architect and other appropriate consultant. The aim of examining priced bills is to detect any errors that may have occurred in the computation of the tender, or any anomalies that could cause problems at the post-contract stage. The areas where examination is most needed are: arithmetic errors, pricing errors and general level of pricing and price of list of basic materials for evaluation of price fluctuation. The quantity surveyor will comment and report on the tenders received to the architect and the employer. The quantity surveyor's report will comment on the general pricing levels and any unusual aspects and possible future matters of concern identified in the priced documents submitted by the lowest tenderer; the extent of any errors or inconsistencies in the pricing and the action that has been taken; details of any qualifications to the tender; the likely cost of

the project compared with the budget; and a recommendation as to acceptance or otherwise (Seeley 1997).

Cox and Thompson (1998) classified dispute resolution into four categorises: resolution by agreement; by intervention; by third-party determination; through litigation. They argue further that resolution by agreement is a means of reaching a settlement through discussion and negotiation between the parties. Resolution by intervention is an intermediary step between negotiation and arbitration/litigation where by a neutral third party is employed to intervene and facilitate discussion and resolution. The next step, third party determination requires a third party presiding on the issues and pronouncing a judgement in order to prevent the dispute getting into the courts. Adjudication and arbitration are two commonly used processes by third party. Resolution through litigation is a process of taken a case to law courts for resolution. There are different courts in which a case may be heard depending on the size or nature of the dispute (Cox and Thompson 1998).

Cox and Townsend (1998) refer to Latham who quoted evidence from Construction Industry Council (CIC) working party discussion document, which express the view that UK spending on construction research and its dissemination is substantially below that judged necessary by a succession of authoritative studies. He argued further that Atkins explained that investment is low in the EC, compared with the likes of Japan, partly as a result of the structural characteristics of the industry, with many small firms, volatile markets creating short term attitudes, low profitability because of cut-throat competition and fragmented industry interest group

US contracting system

The USA construction industry structure is characterised by liberalistic tendencies or market oriented, where barriers to entry in general contracting is generally low. The market is fairly polarised, with a large number of small to medium sized firms competing for the major portion of all commercial output (Cox and Townsend 1998). Clough and Sears (1994) emphasise that construction is commonly divided into four main categories in US: residential, building, engineering, and industrial construction. Although there is some overlap among these divisions and certain projects do not fit neatly into any one of them. Cox and Townsend (1998) postulate that the design professionals supply chain is in the form of multi-disciplinary architectural/engineering practices. There is no core of quantity surveyors or independent cost managers, as re-measurement of completed work is generally not carried out. The bid documents for a unit-price project customarily provide contractors with estimated quantities of each bid item. The quantities are approximates which the architect-engineer assumes no responsibility for their accuracy or completeness. Therefore, either given or not, the contractors make their own quantity takeoffs (Clough and Sears1994).

The construction clients have different organisation to safeguard their interests. The Business Round Table is the largest organisation representing client interest (Cox and Townsend 1998). The owner makes the necessary financial arrangements for the construction of most projects. Public projects are paid for by appropriations, bonds, tax levies or revenues. A large corporate firm may obtain the funds by the issuance of its own securities such as bonds. For the average private owner, funding is normally sought from one of several possible loan sources such as banks, savings and loan associations, insurance companies, real estate trusts, or government (Clough and Sears1994).

Konchar and Sanvido (1998), and Haltenhoff (1999) categorise project delivery methods in US under three headings, construction management; design/build; design/bid/build. Clough and Sears (1994) the prime contractor may be selected on the basis of competitive bidding, negotiation, or combination of the two may be used. The entire contract may be a single general contract, or separate prime contracts for specific portions of the job. The contract may also include project design as well as construction, or combination of responsibility may be primarily managerial. There are two types of

competitive bidding used in the US, open or "hard-bid" and closed bidding approaches. Open bidding is the predominant form where all the contractors use the same proposal form provided with the bidding documents with the bids opened and read publicly. In this approach, the proposal amount is the contractor's final offer and there is no subsequent bargaining or negotiation. In closed bidding, sometimes used by private owners, there is no prescribed proposal form, and there is no public opening. In addition to their bidding amount the contractors are required to submit their qualifications along with their bids and are encouraged to tender suggestions as to how the cost of the work might be reduced. It is interesting to note that preliminary items in UK practice is known as general conditions construction in US practice.

Seeley (1997) asserts that the invitation to bid gives a general description of the project and its location, states where contract documents may be obtained, establishes the deadline for receipt of bids, and provides other general instructions. The employer may also request a list of equipment available to the contractor and provision of bid bond, performance bond and payment bond. The bidding documents will be accompanied by general conditions, supplementary conditions, drawings and specification, but there is unlikely to be any bill of quantities. Dorsey (1997) emphasises that there is a sequential chain of events in lump sum contracts. The owner first enters into a contract with a designer who prepares contract documents, and then the owner selects a general contractor through a competitive bidding process. The general contractor in turn selects, sub-contractors (usually through competitive pricing) to perform parts of the work. Subcontractor may employ sub-subcontractor for specify work. The owner signs only one contract and thus rarely have direct dealings with subcontractors or suppliers. The designer has no contract with any contractor, but act as the agent of the owner for design services and for contract administration during construction. Cox and Townsend (1998) emphasise that at the beginning of the project cost management will depend on the completeness of the design. If the work scope is well defined, the client tends towards fixed price contract but if the design is incomplete the client prefers cost-reimbursement contract. In a project where the owner requires a greater level of cost-certainty GMP is usually adopted. Value management/engineering is one of the tools used to reduce cost. The basic steps followed at various stages in the development of a project are; Establishment of functional objectives of the project; Identification of alternatives; and Examination of cost and value of each alternative to enable 'best value selection'.

Contracts normally stipulate that claims and disputes be first submitted to the owner or its representative. If the claim is denied, the resulting dispute can then be submitted to various levels of appeal, such as appeals boards, arbitration, or the courts. Most public owners have statutory or administrative procedures established for the settlement of court disputes. According to the Contract Disputes Act of 1978, if there is a dispute on a federal construction project, the contractor must first present the matter to the contracting officer and request a final decision. If this decision is not acceptable to the contractor, an appeal can then be made to the appropriate agency board of contract appeals or the U.S. Claims Court (Clough and Sears1994). Cox and Townsend (1998) refer to the Construction Industry Institute (CII), which believes that US construction firms spend too little on research and development, as compared with manufacturing companies or contractors in other countries.

Japanese contracting system

The Japanese industry sector is characterised by communalistic ideology, which has reflected on the way business is carried out and how the construction industry is structured (Cox and Townsend 1998). According to (Kudo 1999) the construction industry in Japan is characterized by its so called "multi-layered sub-contract system" where there is a general contractor, sub-general contractors each with complete working force. He argues that subcontractors are faceless and nameless entities working beneath the well-known general contractor. The core of Japanese contractual agreement is based on shinrai kankei i.e. trusting relations. This term applies more to those situations in which a written agreement does not exist. The principle of fair and equitable distribution of gains and looses defined

by values like on and giri is always valued more highly than the written contract, with its purely monetary grammar. The type of trusting relationships among Japanese general contractors fall into three categories: client and general contractor, general contractors and subcontractors, and subcontractors and sub- subcontractors (Kudo 1999).

In the excerpt taken from tape 1 on the globalisation of building practice (1997) at the Columbia University, School of Architecture, Kenskushi is said to be the Japanese licensing terminology, which is the mixture or combination of architects and building engineers. Tape 2 further highlight that there is a Japanese Architecture Society, which is refusing to license architects who belong to the contractors. The fact that the contractors provide design free of charge or at a reduced charge makes it very hard for architects to compete. Contractors have practically unlimited capital for pre-contract services including finding the site, feasibility studies, securing potential tenants, as well as various preliminary design studies. Once the building is complete, they are able to provide an almost life-long warranty. In a situation when a designer in the employ of a general contractor has won a design contest for a public project e.g. First National Theatre and Supreme Court Building, the designers were requested to set up their own design office in order to complete the working drawings for the project. The buildings were eventually built by the general contractor with which the designers had left.

Cox and Townsend (1998), there is no major quantity surveying presence as the parties rely on trust and credibility to ensure work is completed and reimbursed appropriately. Third party checking and measurement implies criticism or lack of trust in the contractor and wasteful duplication of effort. Kudo (1999) today computerized estimation techniques, the exact quantification of materials and labour, and the standardization of unit prices give the impression that the content of a contract could be quite transparent. However the intricacy and high-level technology of today's construction has far outgrown the simple equation of quantity of materials times unit price. In carrying out contract management in Japan, technical requirements are abstracted from drawings and specifications, while the 'breakdown' (a rudimentary bill of quantities) is only referred to for the valuation of progress payments or significant variations in work.

Fukasawa (1999) has traced the history of bidding and contracting for public works as far back as in the 1889, when the Public Accounts Act specified use of an open competitive bidding system. Jo (1999) emphasises that because of the Japan's construction market through the Japan - U.S. Construction Talks, a succession of scandals involving corruption and bidding at pre-determined prices etc., the Ministry of Construction initiated a major reform of the bidding and construct systems, bringing in open competitive bidding in full use in 1994. There are four major classifications of tendering procedures used in Japan for public works: (1) open competitive bidding Procedure, (2) selective bidding system (3) limited tendering system (discretionary contract) and (4) other bidding system - e.g. the design-build and value engineering (VE) systems. Cox and Thompson (1998), the open tendering process in Japan comprises three main stages: pre-qualification; nomination; and bidding. A high degree of collusion during the tendering process is common between the contractors and this is known as (dango). Although, collision practice is officially forbidden by Japanese law (Cox and Townsend 1998). Fukasawa (1999) the present laws demand that a contract should be awarded to the lowest bidder in either open or selective bidding based on the strict standard that the lowest bid price must be below a ceiling price. Time, quality and then cost in that order are the priority to most Japanese clients. The client will hold certain price expectations in form of Guaranteed Maximum Price (GMP) and will trust the contractor to meet the expectation and provide good service. Apart from the GMP there will be additional cost for extras and client will not know how costs are derived. Project cost structures are hidden and under the control of the contractor. There is no standard method of measurement and estimates are developed by using schedule of rates (similar to UK bills of quantities but not as detailed). Monthly payment to the contractor is made in accordance with the proportion of work done and adjustment for scope changes if is significant else the contractor will accommodate for the cost (Cox and Townsend 1998).

There is no representative body for private client interests although the major clients have considerable power (Cox and Townsend 1998). The Japanese contractors have control over the construction supply chain because they have client trust and long-term relationship with client. The situation of land in Japan is extremely difficult because of high taxes incurred during transaction and cultural attachments to ownership. Many contractors have extensive land banks as a solution to the land problem and increase their competitive edge. Therefore, their role is more of 'price-fixers' instead of 'price-takers'. The lump sum negotiated price is often high due to lack of a value mechanism, such as competitive pricing, and inclusion of high contingency allowances for risks (Cox and Townsend 1998). Kudo (1999) states that The Japanese Big Five "zenecons" (general contractors) can be regarded as the world's largest and finest design/engineering firms, and uses one to two percent of their annual budget for R&D programs. Cox and Townsend (1998), disputes are settled within the bounds of relationships, rather than be subjected to external scrutiny. The competition for few large firms is based on distinct building techniques and technologies offered in providing construction solutions rather than price competition. Price-based competition is more evident on local government contracts. Therefore, research and development is given a high priority to develop and improve technologies and techniques.

Table 1 Comparison of British, American and Japanese contracting practice

Pre-contract stage

THEMES	UK	US	JAPAN
Tendering procedures	• Tender consideration is based on price & value mechanism	• Based on price and value mechanism	• WTO procedure in government contract • Tender consideration is based on long term relationship in private sector
Competition	• Price competition/cost differentiation strategies • QS price as basis of comparison	• Bid shopping • Bid depository process is common to prevent defaults	• Building techniques and technologies • Priced-based competition on government contracts
Construction cost management process	• Preliminary cost plan • Approximate estimate • Use of cost control tools • Use of life-cycle costing • Preparation of BOQ	• Use of value management /engineering • No re-measurement of completed work	• Use of schedule of rates • Use of value management *(Kaizen)* • No third party checking • High contingency allowance
Quality assurance requirements	• A comprehensive quality assurance plan • The consultant's actions closely related to quality management • Subcontractors must submit quality assurance systems	• In accordance with ISO 9000 and ISO 14000	• ISO 9000 as a pre-condition for tendering in public works • ISO 14000 series for environmental management is widely use

Post-contract stage

THEMES	UK	US	JAPAN
Subcontr-actor	• Nominated by employer/architect • Employ by the contractor • Formal contract between nominated subs & employer • Selection on competition or negotiation	• Procurement of Subs is undertaken by project personnel • Construction firm normally have small and stable pools of Subs • Selection on competition or negotiation	• The main contractor prefers to engage Subs instead of direct labour • Often no formal contract between the main contractor and Subs • Selection depend long standing relationship or part ownership
Payments	• Usually based on monthly valuation on the work done and material on and off sites certified by QS	• Usually based on Schedule of rates/values on monthly basis for materials & equipment incorporated in the completed work	• Rudimentary BOQ for progress valuation • Payment on proportion of work done based on GMP

General

THEMES	UK	US	JAPANESE
Criteria to job commission-ing	• Price + value mechanism • Capability of firm • Reputation • Financial stability & capacity • Management expertise • Suitability	• Price + value mechanism • Capability of firm • Reputation • Types of resources • Financial stability & capacity • Management expertise • Suitability	• Site procurement • Guarantee on end users • Long time relationship • Sister companies • Mandatory 1 per cent on R&D
Designer/ consultants	• Design professional supply chain is multi-disciplinary • QS available for cost management	• Design professional supply chain is multi-disciplinary • No Quantity surveying	• Smaller clients rely on the expertise of the contractor • Architecture includes structural engineering • No Quantity surveying or independent cost manager

Legal

THEMES	UK	US	JAPANESE
Dispute resolution	• Adjudication • Arbitration • Legal processes	• Adjudication • Arbitration • Legal processes	• Disputes are settled within the bounds of relationship
Subcontr-actor's risk & liabilities	• Based on the back-to-back agreement	• Based on agreement with the general contractor	• No formal agreement

WTO - World Trade Organisation; **QS** - Quantity Surveyor; **BOQ** - Bills of Quantities; **ISO** - International Standard Organisation; **Subs** - Subcontractors; **GMP** - Guaranteed Maximum Price; **R&D** - Research and Development;

Table 2 Positive and negative attributes of the UK, US, and Japanese contracting practices

Theme	*UK*	*US*	*Japan*
Positive attributes	• *Cost management process* • *Engage works contractors* • *Open tendering procedures* • *Price competition/cost differentiation strategies* • *Price & value mechanism as a basis for job commission* • *Fragmented consultant services*	• *Largest heavy engineering market* • *Homogenous; Common attributes; currency, policy, language etc.* • *Engage trade contractors* • *Economies of scale due to the size of the market* • *Liberalistic tendencies* • *Client's interest well represented* • *Low barrier to entry*	• *Excellent R&D* • *Integrated practice* • *Off-site manufacturing* • *Engage specialist subs* • *No internal barriers or regional difference* • *State protected industry* • *Dispute resolution between the bound of relationship* • *Widely in use, ISO 1400 series for environment management*
Negative attributes	• *Complex dispute resolution* • *Too many 'non value-adding' costs* • *High documentation and complex conditions of contract*	• *Lawyers are too active/involved* • *Contractor movement up scale is restricted by bond requirements* • *No independent cost managers* • *Complex dispute resolution* • *No independent cost consultants*	• *Collusion during tender (dango)* • *Lack of value mechanism/ price competition* • *No representative body private client* • *Life cycle costing not widely used* • *No independent cost consultants* • *No formal contract between contractor & subs*

Building strategies to improve owners' investment

Construction work starts with client requirements, which is combined with site, environmental and regulatory requirements to produce design requirements, which in turn generate into construction requirements. In achieving user's requirements there should be knowledge of project finance either in form of cash flow for payment or as a form of return on investment. The owners' construction process from consultants and contractor point of view will serve as feedback in research and development for future use. Therefore, the four important core segments in building strategies to improve owners' investment are; the users/customer/client; finance; internal construction process; and feedback and learning. These themes have been used because it starts from project inception to completion and warranty period.

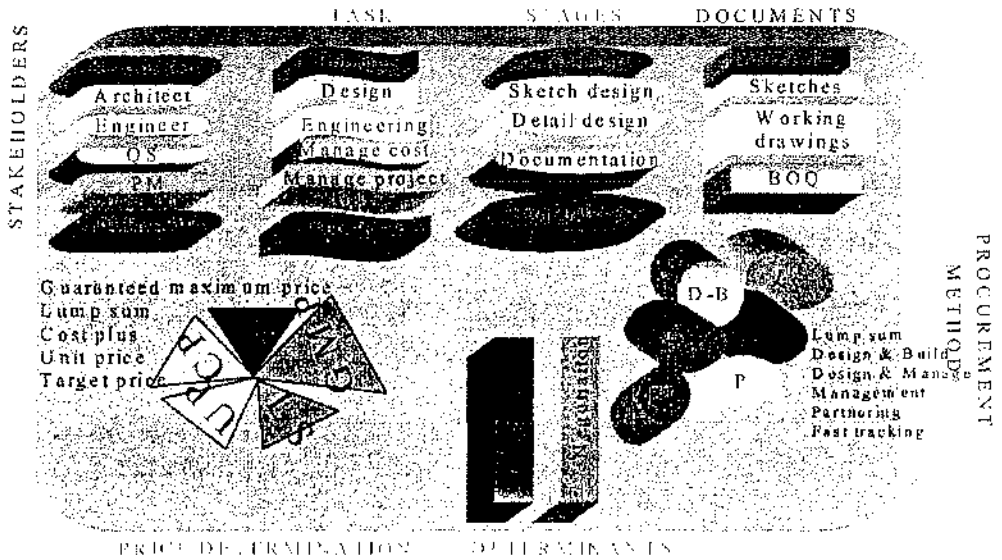

Figure 1 Project total activities from inception to completion
QS - Quantity Surveyor; **PM** - Project Manager; **BOQ** - Bills of Quantities

Figure 1 shows the project total activities from inception to completion from project stakeholders to project task, stages, documents procurement method, determinants and price determination. For instance the institution or client will source for finances and carry out feasibility studies and draw up the project programs in conjunction with other project stakeholders. The type of procurement method sort will determine the type of contract and the determinants factor can be use individually or as a combination to select a contracting firm. Price determination will then be use in arriving on mode and methods of payment.

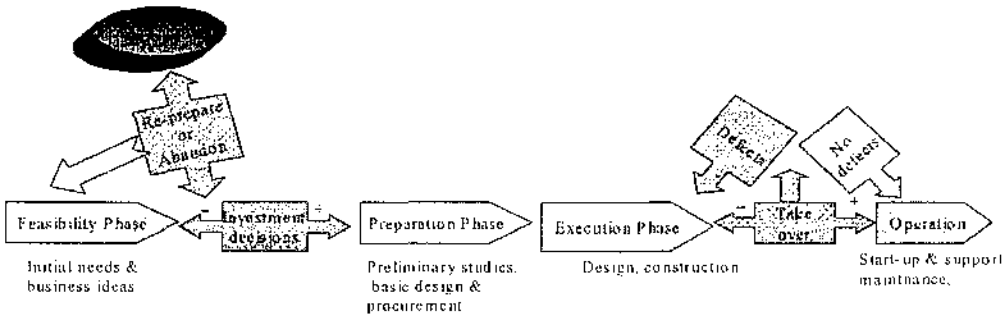

Figure 2 Phases of investment projects from investor's perspective

Figure 2 shows owner's investment decisions, which is divided into four phases. The feasibility phase involves the viability of owner's initial needs and business ideas, and the possibility to raise the required fund for the project. At this point, there is a big investment questions either to re-prepared, or abandon the ideas (if the investment decisions are negative), or to proceed (if the decisions are positive). It will then be follow by preparation phase that deals with basic design and preliminary estimate, and the procurement procedures. The next phase is the project execution phase i.e. construction activities, further development of drawings and overall project management. Quality of work will determine the take over decisions, if there are defects to be rectified, the take over decision will be negative decision - back to execution phase. Operation phase will commences (i.e. start-up and maintenance) when there is no major defect to rectify.

Users/customers/client; is the instigating party for whose purposes the construction project is designed and built. While some private owners do not intend to become the end users but the completed structure is sold, leased or rented to other. Private owners include large and small corporate companies, individuals, builder-vendor and developers. Public projects are built to meet some defined public needs by governments and its agencies.

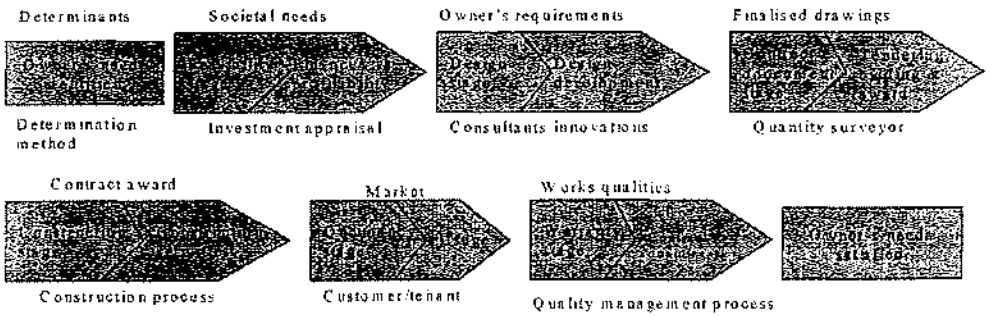

Figure 3 Interrelationship between process/stages/activities

Figure 3 shows the construction process/stages/activities from a point where the owner's requirements are identified to a point where the owner's needs are satisfied. At the feasibility stage, societal needs and investment appraisal will determine the feasibility of the project. Owner's/user's, site, environmental, statutory requirements and consultants innovations will determine the design stage. At the contract documentation stage, the level of finalised drawings and the delivery system intended to employ will determine that stage. Construction stage will most depend on the ways the construction activities are been carried out, while market situations and the end users will determine occupancy stage. Warranty stage will be determined by works qualities and quality management process from project inception to completion.

These segments represent the sources that will deliver the revenue component of the owner's financial objectives. The users allow the owner to align their core user outcome measures-satisfaction, loyalty, and profitability-to targeted users and market segments, since users are not homogeneous because of differences in preference and values. In-depth research method would reveal their preferences along dimensions like price, quality, functionality, image/aesthetics etc. For a project to be successful the users/customers/client must have clear business strategy and commitment to project and to partnership sprit. The users/customers/client must have capacity to accept risk and have risk management ability, in a way having some equity stakes in the project or long time lease or rent agreement. The end users/ operator should be involved from the beginning during project conception, designing and construction. The users/customers/client should have short approval chain and response time in other to avoid delay.

Financial

Construction is usually expensive, be it provision of infrastructures or other private projects. In a situation where the potential client lack the financial resources or the financial resources is grossly inadequate to embark on the project, the need arise for additional financial resources to be mobilised from the financial market.

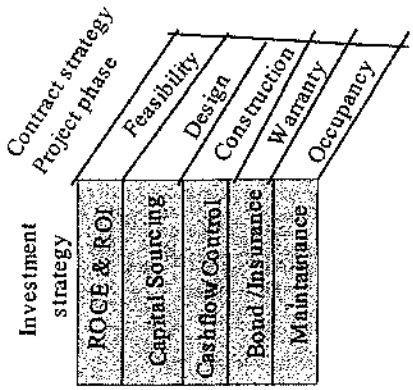

Figure 4 Investment and contracting strategies
ROCE - Return on Capital Employed; **ROI** - Return on Investment

These segments serve as the focus and determinants to other segments (users, internal construction processes, and correction and amendments of what has been learnt). Finance can be viewed from two perspectives as a rate of return i.e. profitability on capital employed (construction versus placing assets in liquid securities) or as a cost of realising the project (project cash flow). To most owners the financial themes of increasing revenues, improving cost and productivity, enhancing asset utilisation, and reducing risk will be the main financial objectives. Project finance is a big project determinant, which can be obtained from various sources for smooth cash flow during construction process. Internal source e.g. bank, security companies, insurance companies, owner's fund etc.; external source e.g. external borrowing, alliance, merging, joint venture, equity stake by principal stakeholders and other form of partnerships. The project can also be design in a way where the contractor will have financial stake in the project, in form of equity stake. In that case there should be a risk/reward balance shifting, in form of shared responsibility in construction and overall investment. Risk allocation to the contractor in form of equity stake will increase his commitment and technical input, project quality and reduction in project costs.

Internal construction process; it involves design, construction and facility management or disposal. This is the core area in owner's investment; it involves many stakeholders, which result to fragmented supply chain. The overall aim to the owner is to improve quality, reduce cycle times, and increase output. Internal construction process can be divided into three principal business processes; design innovation/documentation, construction operation, and facility disposal. In design innovation/ documentation process, the architect designs or creates the products or services to suit users demands, which serves as the owner's requirement. The cycle involves many alternative solutions from architect in form of sketches and the approximately cost of the alternatives by the cost expert. This should involve the use of flexible design, open-ended design for easy conversion and life cycle costing, value engineering and management for the replacements and maintenance. The end result will be a products or services that will meet owner's requirement within the available limited resources. This process includes preparation of necessary documents, bidding and award as a guide in construction operation. Proper evaluation of the price, engineering prowess, financial capability and capacity of the bidders and the client should be a good deciding factor. In some cases, innovation design process can be sandwich with construction operation system to shorten construction time, which will eventually reduce cost.

The second process is construction operation process, which involves building and delivery of the products within the time frame at required quality standard. Total quality management, reengineering, alliances, partnering, just-in-time production and distribution systems, joint venture and fast-tracking will reduce owner investment both at the construction time and maintenance period. There should be a separate cost management system within or outside owner's organisation. This will result to a check and balance, even distribution of power in supply chain, and check and balance in pre-construction

documentation and project determination and subsequent valuation and payment in construction stage. Finally, facility disposal should start when the idea was conceived, in other word; the owner must find a suitable buyer before embarking on the project either as a lease, rent, or sale.

Feedback and learning

Controlled feedback loops are needed in order to maintain consistency in meeting requirements and improving in building processes and systems. Feedback in construction is basically research and development carried out either by the project consultants' or/and construction contractors to improve productivities. The input for the feedback will include among others, skills and knowledge, labour, materials and equipment used, their performance standards, and processes and procedure of carrying out the project. The result of research will lower construction cost, time and improve quality, and serve as a basis for competition. Knowledge gained in each stages/tasks/trades should be recorded as a means of learning for better performance and dispute elimination.

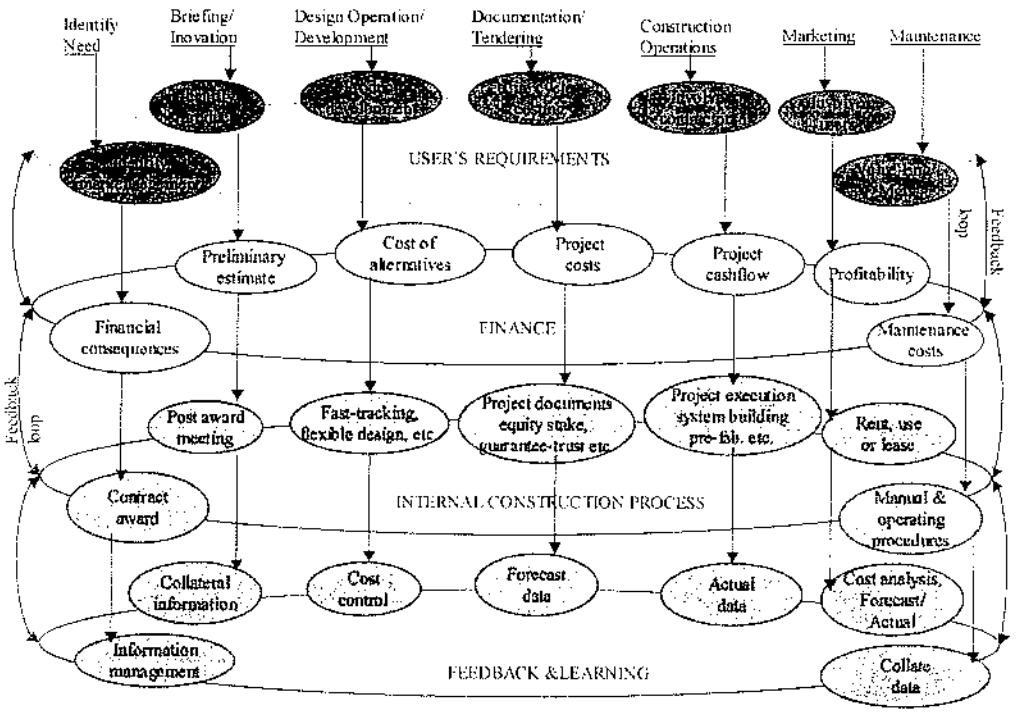

Figure 5 Owners' investment targets, measurements and project objectives

Owners' strategy start by identifying user's requirements in terms of market segment and project identification. In product or project development stage, there is a need to involve the consultants, project contractor(s) and the users so that constructability and usage will be taken into consideration in product design. As the owner is identifying the market segments, the financial consequences of the product and the finances for embarking on the project and maintenance cost should be the main issue. This can be achieved by carrying out rate of return on capital to be employed (ROCE) and return on investment (ROI) to determine the profitability of the project. Apart from borrowing from financial institution and security companies the owner should involve other project stakeholders to have equity stake in the project. Equity holding may also be in form of guarantee-trust by third party on behalf of a stakeholder. Early selection of a contractor and third party project monitoring and control is very essential for effective cost management. Feedback information in all the processes involved i.e. forecast/ actual cost should be collate for future learning. All the stakeholders could use this information in

future research and product development to reduce owner exposure to financial, liability and responsibility risks.

CONCLUSIONS

The owner should be explicit about the customer and market segments in which it has decided to compete. He must also set out its financial goals either to achieve market growth, profitability, or cash flow generation and setting target for the project cost. The owner will then establish and identifies the objectives and the measures for its internal construction process, which will involve setting targets for overall construction process and checking the quality, time and cost as a means of control. The owner will align initiatives in design and documentation; procurement and construction and allocate resources to meet the time schedule. The final linkage will be to learning and feedback, which may result in reskilling employees, on the outcome of the information collated and analysed before, during and after the project. These investments in people, systems and procedures that were bit faulty, will generate major innovation and improvement for internal construction process for the owner.

The owner should also build a winning alliance not only in innovation design/documentation segment but also within internal construction process. There is a need to involve third party checking in over all cost management to allow for balance of power within the supply chain and also to assist in pre-construction bidding and contracting documentation.

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FROM COST TO VALUE: TERTIARY EDUCATION FOR THE QUANTITY SURVEYOR IN NEW ZEALAND

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ABSTRACT

This paper discusses the change in emphasis from "cost" to "value" in tertiary education of the Quantity Surveyor in New Zealand. An overview of the traditional role of the Quantity Surveyor is presented, with the main emphasis historically being on measurement and cost. The development and expansion of the Quantity Surveyor's role is then discussed, which has led to a change in emphasis from cost advice only, to adding value for the Client. This change is illustrated by an examination of the Cost & Value Studies strand of the Bachelor of Construction degree programme at the School of Construction at UNITEC Institute of Technology, in Auckland, New Zealand. The paper concludes by posing questions regarding the future direction of the Quantity Surveying profession, and how education provision for QS undergraduates can be developed to address this change.

Keywords: Cost, Education, Quantity Surveying, Value

INTRODUCTION

It is not the cheaper things in life that we wish to possess,
But expensive things that cost less (John Ruskin)

Quantity Surveyors have a history of paranoia regarding their identity; once content to be 'measurers', they are in continuous debate regarding their role in the context of threats and opportunities in the developing industry markets (RICS, 1992).

Indeed, the Quantity Surveying profession has been struggling for some time with the generic term 'Quantity Surveyor' [or 'QS'], which has embedded concepts of quantification and measurement, which does little to suggest the wide range of services that are offered by the modern construction cost consultant (Beddek, 1991).

In 1964, the Banwell Report defined the QS as the "economist of the construction industry" (Banwell, 1964). Now, approaching forty years on, the Quantity

Surveyor's role has broadened and the nature of the industry has changed radically - Clients demand more value for money in a highly competitive global market - the implication is one of adding value - doing more with less.

THE METAMORPHOSIS OF THE QS - FROM COST TO VALUE (Refer to Fig.1)

I do not know which makes a man more conservative -[i.e. risk averse] - to know nothing but the present, or nothing but the past (John Maynard Keynes)

Late 1800's to 1950's: Quantification and Document Preparation

Although the roots of quantity surveying go back to the 17th century in the UK, quantity surveying bearing any semblance to what we perceive today as the traditional role of the Quantity Surveyor came about in the late 19th century, when Quantity Surveyors were employed directly by the Client, under the authority of the Architect, to prepare Bills of Quantities upon which tenderers would price the work.

Most Quantity Surveyors in those days had previously been tradesmen, whose practical knowledge and skills allowed them to acquire the core skill of the Quantity Surveyor - the accurate measuring and describing of the construction work from drawings, i.e. quantification and document preparation.

However, the Architect, as principal consultant, retained ultimate financial responsibility for the construction costs - the QS remained in merely a financial advisory role - this was partly due to the reluctance of the QS to accept the responsibility and liability for controlling costs (Davis, Langdon & Everest, 1991), but was also due to the construction industry's attachment to the 'traditional approach' - utilising a lump sum fixed price procurement method.

So, up until the 1950's, the role of the QS was limited to cost monitoring or accounting, and was restricted to the preparation of approximate estimates, contract documentation and final accounts (Ashworth, 1999). The Quantity Surveyor's training was mainly 'on the job', starting as a 'cadet' under the guidance and supervision of a senior QS, and was a type of informal apprenticeship, served for many years until the cadet was considered worthy of the title 'Quantity Surveyor'.

Symbolic of attitudes towards value for money at the time, the Client's 'budget' would frequently be established as the design developed - consequently, cost planning was relatively weak, and it was common for tenders to far exceed the estimates of cost.

1960's: Cost Planning

During the 1960's, it became obvious that the existing cost control procedures provided by the QS profession were too limited, and many major Clients in the UK, who had become increasingly cost conscious, demanded a changing emphasis in practice from one that was largely reactive, in the case of an accounting function, to one that was becoming more proactive in respect of forecasting and controlling construction costs. This was the first significant shift towards adding value to the construction process (Ashworth & Hogg, 2000).

Cost planning was developed and refined through the 1960's and 1970's, based on the elemental approach, where construction costs are allocated to individual elements or sub-elements, determined by their function. This led to the widespread use by the QS of Elemental Cost Analysis, in order to "design to a cost" or "cost a design". These two different approaches were eventually combined into a single cost planning system - this development went part of the way towards meeting Clients' demands for more balanced building design, and securing value for money.

In New Zealand, the Certificate in Quantity Surveying was introduced, run under the auspices of the Institute of Quantity Surveyors, and was studied either full or part time at local colleges, and amounted to an equivalent of two years of full time study. This was sufficient to provide the technical core skills of Quantity Surveying at the time - the preparation of approximate estimates, contract documentation, interim payments and final accounts.

1970's to 1980's: IT and Value-added Services

Several new concepts in building economics were developed in the UK during this time: costs-in-use; cost modelling; cost engineering techniques; life cycle costing; and value engineering, to name but a few. These were developed to satisfy the increasingly Client-driven demand for adding value to the design and construction process. This research and innovation was possible largely due to the relatively advanced level of QS education available in the UK at the time - undergraduate degrees had been introduced in the late 1960's, and Masters level programmes relating to construction were introduced in the late 1970's/early 1980's.

In New Zealand, the Diploma in Quantity Surveying was introduced in the 1970's, consisting of 'top-up' papers for graduates of the Certificate, to advance their skills in the more strategic matters associated with professional practice, and to be able to offer services such as cost forecasting, estimating initial budgets and cost planning - i.e. value-added services.

In the late 1980's, Project Management began to be seen as a skill that Clients would require in the future, and the emphasis on building costs also switched from that which concentrated on initial costs alone towards a more holistic view of costs over the entire life cycle of the project (Ashworth, 2000).

1990's: Diversification

The rapid advances in Information Technology in the 1980's led to specialised software which greatly assisted the QS in the production of Bills of Quantities, which inevitably led to a reduced technical role for the professional QS in the traditional services offered to Clients. As stated by Beddek (1991): "we have to divert attention from our relatively narrow, increasingly outdated services to the development of initiatives for the future. We have to diversify". The most notable specialisation within the profession is that at the front end of the construction process. The shift has largely been the result of changes in Client requirements coupled with changing procurement procedures and contractual arrangements.

By the 1990's, the QS had developed specialist services in addition to the core services previously offered: "most of the areas expanded into, revolve around financial/economic advice and contractual advice" (Hatfield, 1999).

In New Zealand, as Wilkinson states "quantity surveying practices are now offering a range of professional services such as value management, facilities management and project management. This could be linked to a bid by quantity surveyors in New Zealand to be regarded as professionals rather than technicians" (Wilkinson, 1995).

Client demand for management-orientated value-added services, and the growing emphasis on value and the management of cost in the context of other criteria, were seen as areas of paramount importance, and the underlying themes of two reports on the performance of the construction industry in the UK carried out in the 1990's have been similar - improving value for money (Latham, 1994, and Egan, 1998). This theme is equally applicable in the New Zealand context, and the implication is one of adding value by reducing building costs. In response to the greater sophistication in Client's requirements together with a noticeable shift in emphasis from 'cost' to 'value' and from expediency to quality (Barton, 1989), the New Zealand QS has been forced to diversify into previously uncharted territory. The ability to cost manage the whole of the process is essential if the QS is to fulfil their claim to be managers of construction cost. Value Management and much greater front end cost certainty are required as basic skills. The findings of the 1998 RICS report "The Challenge of Change" have had a significant impact on tertiary education for the Quantity Surveyor; what is needed in the future will be "graduates with a combined technical strength, broader business skills and a commitment to further continuous learning" (RICS, 1998).

THE BACHELOR OF CONSTRUCTION (QS MAJOR) AT UNITEC

Background

Prior to 1992, the only tertiary qualifications available to New Zealand Quantity Surveyors were the New Zealand Certificate in Quantity Surveying (technician level), and the New Zealand Diploma in Quantity Surveying (advanced technician/professional level). Many of today's largest construction firms have Directors who hold these qualifications.

In 1990/91, the School of Construction at UNITEC made the decision to be the first in New Zealand to develop and subsequently offer two degrees from 1992; one in Construction Management, and the other in Quantity Surveying. In 1997, the two degrees were merged into the Bachelor of Construction (B.Con) with two majors; one in Construction Management and one in Quantity Surveying.

The Bachelor of Construction is a three year full time equivalent programme, with the final year courses run in four two week blocks, which allows students to work in industry if they wish to, and study part time.

The New Zealand Institute of Quantity Surveyors (NZIQS) has made a degree a pre-requisite of entry to professional membership from 1st January 2000. This recognises the increasingly high level of professionalism demanded by the industry of Quantity Surveyors, and mirrors the decrease in interest among Quantity Surveyors in providing technical services (more related to cost alone), and the ever increasing interest in providing management (value-added) services.

Objectives specific to the Quantity Surveying Major

At the completion of the Bachelor of Construction, graduates will be able to:
- Quantify building work of all types
- Estimate the cost of building work, both during the design phase and from detailed construction documentation
- Conduct feasibility studies
- Undertake cost planning and cost control with respect to the design and construction of buildings
- Undertake life-cycle costing studies
- Analyse the performance of buildings
- Work with other members of the design team to enhance the value of buildings during the design process

The Cost & Value Studies Strand (QS Major)

The courses comprising the Cost & Value Studies strand are outlined below (refer Fig.2):

Cost & Value Overview (Year 1)
- The design & construction process
- Why build?
- Time, Cost, Quality and Value
- The conventional procurement process
- The role of the parties to a building contract
- The Schedule of Quantities
- Taking off - manual & computerised
- Standard method of measurement
- Unit Rate Estimating
- Elemental & other early phase estimating techniques

Value Enhancement (Year 2)
- Cost & Valuc
- Discounted Cash Flow
- Present Value
- Feasibility Studies
- Cost Planning techniques
- Life-cycle costing
- Value Management
- Functional Analysis

Measurement (Year 2)
- The purpose of measuring
- Measuring theory
- Measuring practice (advanced)
- Different Methods of Measurement
- Information structuring
- Measuring & Information Technology

Services Economics (Year 3)
- Special issues for estimating & measuring building services
- Measurement of building services
- Life-cycle costing for building services
- Estimating/cost planning of building services

Tendering & Cost Control (Year 3)
- The tendering process
- Risk analysis of procurement processes
- Principles of unit rate estimating
- Principles of resource-based estimating
- Principles of operational estimating
- Subcontract quotation and analysis procedure
- Cost control & feedback
- Quality Assurance of the estimating function
- Budgetary Control, Financial Reports
- Final Accounts, Contractor's Claims

Design Phase Estimating (Year 3)
- Diversification of the QS
- Advanced design phase estimating techniques
- Development Appraisal
- Design Economics
- Whole-life Costing
- Value Management
- Facilities Management
- Taxation
- Investment
- Cost Modelling
- Risk Analysis
- Benchmarking
- Lean Construction

The above courses form the core skills recognised as being of relevance to the Quantity Surveyor in the new millennium. The School of Construction at UNITEC will be undergoing a major five year

review of the Bachelor of Construction programme for 2002. As part of the review process, we will be seeking advice from QS practitioners and others in the construction industry on how we, as the primary providers of construction management and quantity surveying tertiary qualifications in New Zealand, can meet the challenges presented by the increasingly complex and diverse nature of the construction industry.

CONCLUSION

The Future Role of the QS - Adapt Or Die

> *...The cost of construction is only the first cost and is far less important than the subsequent costs associated with running the building and operating it. Techniques that are only of value in minimising construction costs fall far short of what is really required if the designer is to be in a position to provide buildings which offer the best value for money. (Stone, 1980, in Smith, 1998)*

Construction projects in the future will no longer be judged on capital costs alone; the balance of capital and revenue costs will be fundamental to businesses making the right judgements to meet their business objectives. The Quantity Surveyor in the 21st century will need the ability to formulate cost options and determine functionality over the total building life span, i.e. add value to not only the design and construction processes, but also to the Client's whole business. In order to be effective in adding value, the Quantity Surveyor will need to have an understanding of how the Client's business unit operates in a highly competitive global market.

The Quantity Surveyor will need to upgrade his or her skills. Technology threatens to oust the technical role of the profession, and there is a greater need for training in economic, finance and management matters. The Quantity Surveyor will need to: develop a greater understanding of business and business culture; develop strong communication and IT skills, and understand that value can only be added by managing and improving the Client's, customer's and employer's performance (RICS, 1998).

A report written in 1995 on behalf of the Royal Institution of Chartered Surveyors entitled "Improving Value for Money in Construction" highlighted the importance that the role of education and training must have in achieving value for money (Atkin & Flanagan, 1995). We, both tertiary education providers and industry practitioners alike, must endeavour to engender a commitment to continuous learning in the new generation of Quantity Surveyors, so that the profession continues to grow, and increase the diversity of services offered, by combining technical strength with broader business skills. We have identified the "why" - we must now work on the "how".

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FIG. 1: METAMORPHOSIS OF THE QS-FROM COST TO VALUE

Time	Research/Development	Practice	Education
1950	Standard methods of measurement	Approx. estimating Bills of Quantities Interim Payments Final Accounts Cost monitoring	'On the job'
C			
O			
S			
T			
1960	Elemental Cost Analysis Cost Planning	Cost forecasting Budgets	NZ Certificate
1970	Costs-in-use Contractor's Estimating	Cost Plans Procurement advice	NZ Diploma
1980	Value for money Life Cycle Costing Cost databanks Value Engineering Cost Modelling	Post-contract cost control Contractual advice/claims Design & Build	Postgraduate education (UK)
1990		Facilities Management	B.QS (UNITEC,1992)
V	Diversification:	Value Management	B.Con (QS major) (Professional)
A	Quality Management	Project Management	
L	Value Management	Development Appraisal	
U	Risk analysis	Business Strategy	National QS Diploma,1996 (Technician)
E	CAD/IT	CAD/IT	
2000	'Lean Construction" Benchmarking techniques Adding Value	Buildability Asset Management Process Management Partnering Management Consultancy Cross-disciplinary practice	NZIQS require degree for Associate membership
????	???	Project strategy work? Cost Management? Project Auditing/Analysis?	

Adapted from Ashworth (1999)

TOPIC	Year 1 CVO	Year 2 VE	Year 2 MMNT	Year 3 SECON	Year 3 TCC	Year 3 DPE
Role of the QS	*(Intro)					*
QS Practice/Procedures	*(Intro)	*				
Measurement	*(Intro)		*	*		
IT Measurement	*(Intro)		*	*		
Contract Documents	*(Intro)		*	*	*	
Specifications	*(Intro)		*	*	*	
Preliminary Estimating	*(Intro)	*		*		*
Elemental Estimating	*(Intro)	*		*		*
Cost Analysis	*(Intro)	*		*		
Cost Planning	*(Intro)	*				*
Cost Data	*(Intro)	*				
QA	*(Intro)	*	*		*	
Tendering Process	*(Intro)				*	
Procurement Methods					*	
Unit Rate Estimating	*(Intro)			*	*	
Added Value Practices	*(Intro)	*		*		*
Development Appraisal		*(Intro)				*
Design Economics		*(Intro)		*		*
Indices & Trends		*				
Whole life Costing		*(Intro)				*
Value Management		*(Intro)				*
Economics of Quality		*(Intro)				*
Facilities Management						*
Market Conditions					*	
Subcontract Quotations				*	*	
Operational Estimating					*	
Bidding Strategy					*	
Cashflow Forecasting					*	
Interim Payments					*	
Budgetary Control					*	
Financial Reports					*	
Final Accounts					*	
Contractor Claims					*	
Taxation						*
Investment						*
Cost Modelling						*
Risk Analysis						*
Benchmarking						*
Lean Construction						*

Fig. 2 Cost & Value Strand – B.CON – Unitec

MARKETING THE PROFESSIONAL QUANTITY SURVEYING SERVICES — AN OVERVIEW

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ABSTRACT

The intensification of competition for Quantity Surveying services in the wake of globalisation have led to management and marketing expertise becoming as important as pure technical skill. Marketing does not simply mean advertising. Marketing is a management function. It is something that can be done with as much professionalism as the work of a Quantity Surveyor. With the globalisation/ liberalization of the service industry, it is time that Quantity Surveying practices look at how they could market their services not only locally but also internationally. As such, this paper will present an overview on how Quantity Surveying firms could incorporate marketing strategies as part of their management function.

Keywords: Marketing, Quantity Surveying Services, Strategies

INTRODUCTION

The Needs Of Marketing For The Professional

The professional services are constantly changing and expanding, in response to client demand and evolution of new technology. Clients are always seeking either a highly specialised and personalised service from a number of sources or a wide range of skills from a single source. The intensification of competition for Quantity Surveying services have led to management and marketing expertise becoming as important as pure technical skill.

Even if the practice is perfectly managed and has developed the ultimate range of services, its success will be determined by its marketing approach and its ability to penetrate into their target market. Private practices should develop a strategy where one of the element should be a continuous short-term drive for competitive advantage through marketing, the bundling of services and new services development. There is the need for the professions to promote themselves proactively in the relentless search for business opportunities (Ajanlekoko, 2000).

Practice development does not necessarily have to increase fee income. Its purpose can be to yield

an improved "mix" of work, which maximised the firm's skills, resources, interests and specialisation. Therefore, an optimum "mix" will eventually leads to increased profitability, greater work satisfaction, improved career opportunities and better service to clients.

Definition of Marketing

A major pre-occupation of marketing is to ensure that the product is what the customer wants while the purpose of marketing is to create satisfied customers in a way which is profitable to the firm.

Marketing is seen as a management function. It organises and directs all those business activities concerned with supply and demand of goods and services. It assesses the purchasing power to forecast demand and converts the purchasing power into effective demand. Marketing supplies the goods or services to clients. It aims to achieve the profit target, which is set by a firm.

For most of its existence, marketing has been misunderstood. Some people see marketing as manipulative, wasteful, intrusive and unprofessional or they equate marketing primarily with advertising or selling. These beliefs have made it difficult for marketing to gain acceptance outside of the conventional business world.

However, marketing is something that can be done with as much professionalism as the work of a quantity surveyor. The professional marketer is someone who is skilled at understanding, planning and managing exchanges.

Differences Between Goods (Products) And Services

The marketing of products and the marketing of services while sharing common tools have different messages to say. No services can be performed without the existence of a physical element; no product can be made or marketed without the existence of a service element. The main difference between goods and services is that goods are produced whereas services are performed.

Professional Services

"A professional service is one purchased by industry and institutions from individuals and organisations, and is designed to improve the purchasing organisation's performance or well-being and to reduce uncertainty by the application of skills derived from a formal and recognised body of knowledge, which may be interdisciplinary, and which provides criteria for the assessment of the results of the application of the service"(Loft, 1982).

A Quantity Surveyor's service can only be purchased meaningfully from someone who is capable of rendering the service. Selling skills and personality by themselves are meaningless. The client's assessment of the services they receive and their willingness to pay fees is determined as much by their opinion of the Quantity Surveyor's efforts as their opinion of the results

The Basic Concepts In Marketing Professional Services

The marketing concept holds that the problem all business firms face is to develop client loyalties and satisfaction. The key to doing this is to focus on the clients needs. The short term problem of firms is to persuade clients to buy existing services but the long run objective is to create the services buyers need and to ensure they are aware of the existence of the services. This is where marketing comes into play.

The professional services have three critical parts. First is the reduction of client uncertainty. A Quantity Surveyor's services must take a direct contribution to the reduction of personal or business uncertainty. The proper assessment of any services, unlike that of tangible goods, must take into

account the impact of its performance on the client.

Second is the need to understand client's needs and problems. A Quantity Surveyor must come directly to grips with the needs and problems of the purchasers of the service. The successful performance of the service depends on an understanding of the client's business. Therefore, a good service firm must be able to convince the purchaser the benefits of his service. This can be done either by personal contact, history case which cite the successful past performance and/or an ad-hoc approach of convincing the customer.

Thirdly, a Quantity Surveyor's service can only be purchased meaningfully from someone who is able to give the client a first hand service. This will effect more confidence than if the client was dealing through a third party or agent.

Identify The Need Of Services

Selling professional Quantity Surveyor services is a matter of communication by which ideas are exchanged. In professional service marketing, there are a few key questions to answer for the marketing effort to be successful.

a) Is a service needed? The need for a service may come from several sources. A service company may identify a specific problem and solve it. Generally, most of the need is recognised by the client.
b) What type of service is needed? The service firm must be able to identify the right service to meet the particular need. This is called the differentiated nature of the service.
c) Who needs the service? The decision makers are those who called for the service to be supplied. It is important for the service firm to identify the customer's decision-making unit and to be able to solve their problem.
d) How should the service be rendered? The client should be considered together with the time and the service rendered.
e) To whom the service should be rendered? The service firm must be able to identify who will be directly involved in the services provided.

Choosing A Professional Service Firm

The decision to chose the right firm is an important factor because business is a human activity and commitment to change is always occurring. The major reasons for seeking professional services are the need for special skill requirement, legal requirement, lack of special resources, anonymity of confidentiality, e.g. new product development, the need for total objectivity and the need for a neutral party (agent).

However if a service firm has previously provided satisfactory services to the customer, it is likely that repeat purchase will be made. Usually, screening will take place to ensure the best fit between service need and service rendered so as to obtain value for money.

Professional Ethics

The essence of the professional approach in obtaining business is that it should be allowed to come without being sought by the professional. Strict rules, associated with advertising and sales promotion, are often imposed on members to refrain them from canvassing for business. Active advertising and sales promotion are often regarded as placing the professional service in an unprofessional atmosphere. However, this is inconsistent with the demands made on the professional service firms whom are expected to supply services at competitive market price and at the same time maintain service liability. Many institutions are now beginning to accept that marketing of professional services will have to be

reconsidered seriously and adopt a more relaxed attitude towards advertising and promotions of service firms.

For the profession to move forward with time, institution need to change and accept that marketing is important for the professional services. The main difference between professionalism and commercialism is, professionalism has the essential man-to-man relationship between client and professional. No sales process can tamper with this. Sales specialists and sales technology can be used to expedite achievement of this relationship but never to replace it.

In view of the above, professional bodies which govern the conduct of Quantity Surveyors must re-evaluate their regulations on marketing activities by the members. Alternatively, the professional Institution could on behalf of its members, promote and educate the public on its services so as to release its members from dependence on other professions.

Professional Fees (Pricing)

A fee is the price charged for a professional service. It is the sum for the professional who is prepared to provide services and the client who is prepared to buy services. The general pricing policy originally employed by professionals is a per-diem-rate, i.e. an agreed percentage (%) as set down by the professional institution.

However, this scales only reflect an average situation and they only take account of a few variables which can affect the quantity of resources needed to do the work such as the value of the project, the building type, nature of the client, detail of quantity surveying service required, expected duration of design process, contract duration, location of firm and other consultants relative to the Quantity Surveyor's own office.

A professional firm is in business to sell the skills of its staff in order to earn profit for the owner(s) of the firm. Market circumstances and competitive pressures will dictate the level at which professional services can be priced. Other influencing factors includes prevailing balance between supply and demand, ease of entry into the market such as, if only professional qualified person(s) can carry out the work and general level of activity in the local economy

Even though professionals have regarded price competition as unethical, many professional firms are still influenced by fee competition. In a competing situation, a better firm may charge more than the recommended percentage arguing that they provide better, more efficient service.

However, it is dangerous to offer a price lower than that being suggested by the competition which may give rise to doubts as to the quality of the service to be given.

The Quantity Surveyor

The Quantity Surveyor, described as a construction economist, is the financial manager of the construction team. The traditional skill required in a Quantity Surveyor is a skill in measurement and valuation in the field of construction in order that such work can be described and the cost and price can be forecast analysed, planned, controlled and accounted for" (RICS, 1983).

However, in today's situation, clients are not prepared to expend fees solely on the production of accurately measured documentation based upon fully detailed design information. The Quantity Surveyor is expected to be more flexible; to advise on alternative solutions and to give the client maximum protection within any given set of criteria. The modern construction industry is complex and it is the Quantity Surveyor's job to provide clients with expert advise on cost and contractual matters.

The Quantity Surveyor now has parallels with the accountant, who started off with the audit and has been using his financial expertise to home in on the management role (ICE, 1986).

MARKETING STRATEGIES

Segmentation and Marketing Mix

In business, strategy might be defined as the creation and implementation of plans desired to accomplish long-term objectives and they are likely to induce major changes in the relationship between the firm and its competitive environment. In marketing planning, there are two main components namely segmentation and marketing mix.

Segmentation means a selection of market targets, i.e. matching the firm's resources against its market niche(s). Purpose of segmentation is that it serves to differentiate a firm and what it offers from all others, which will create a special and selective demand for its output.

In addition, it makes a direct appeal to particular segments of the total market where present purchases accord less closely to its requirement than the differentiated offer. Based on a survey done in UK, Quantity Surveying firms surveyed have expanded their services to provide a range of specialist technical, management and consultancy services in addition to the traditional quantity surveying services (Page, et.al., 1999). Amongst the services provided are facilities management, project management, construction management, value management and legal service/dispute resolution (Page, et.al., 1999). This shows that dependence on the core business of quantity surveying is no longer sufficient for growth. A firm must expand and penetrate into other segments of the market.

Marketing mix means a combination of various marketing functions such as product, price, place, promotion and service which ensures that appropriate skills, techniques and price are matched with the market segment needs. This is the area in which professional firms have been slow to penetrate due to the restriction of strict rules imposed by professional bodies against their marketing activities.

However, in this age of the internet, the usage of web-site to match skills and market needs should be utilise to the fullest. Quantity Surveying firms which includes completed projects in their websites allowed potential clients to match their proposed projects and needs with the firm's experience (CSM, 2000). In one case, this has been proved successful to the extent that the website is now an integral part of the firm's marketing philosophy (CSM, 2000).

Identify Market Opportunities

The identification of an opportunity is, at its simplest, the identification of a need for a service, whether or not the user of the service recognised the need. It is one thing to identify a market opportunity, but it needs another to pinpoint the actual organisations within it. Thus, the generic to the specific is now needed, e.g. it is not enough to describe oneself as a Quantity Surveyor but rather to describe oneself as a Quantity Surveyor specialising in facilities management. This process is also known as segmentation.

Market segmentation gives rise to the unique selling proposition of a firm. The service company must be able to identify the specific advantage it has over its competitors and also of how they measure against the project needs. The simplest technique to develop for this type of proposition is the use of a SWOT analysis (Strengths-Weakness-Opportunities-Threats). An example is listed in Table 1 (see next page).

A critical SWOT analysis of a professional service could direct its resources to a specific situation,

which leads to a greater penetration into specific market segment rather than a general approach to take anything that is available.

Strengths	Weakness
- Specialisation and capability	- financial resources: actual and potentially available
- location	- lack of skills: management, professional
- human resources	- technological resources: equipment, academic etc
- personal network	- performance: standard of services required
Opportunities	**Threats**
- present services for present clients	- competitions: existing and potential
- new services for present clients	- social-economic force: political,economic,technology, etc
- present services for new clients	- public environment: media, professional organisation, etc
- new services for new clients	- shrinking market

TABLE 1

Characteristics Of Buying Situation

Marketing can never be effective unless it is directed and implemented with knowledge of the buying situation. The marketer of a service firm needs to establish the category into which the buying situation falls and to adopt the appropriate strategies. Generally, there are three characteristics of the buying situation.

First is the new purchase situation. In this situation, the buying firm has never purchased a service before from any particular service company. The need for new purchase may be due to a changed condition in the buying firm. The market is widely open and it is up to every firm to prove its worth. If a firm can convince the buyer, it will be at a distinct advantage. Thus the combined marketing approach of reducing uncertainty, understanding customer's problems and demonstrating professionalism offers the only consistent prospect of success.

Second is the repeat purchase situation where the buying firm returns for the same services. It occurs when no changes are required in the service previously rendered.

The third situation is the new services where marketing concentrates on customer requirements and to satisfy their demand. Therefore, a totally new type of services could exist. The service company has to identify the buyer's need and explain the benefits of the new service to the buyer. Each category of buying has different information needs. In a new task the client requires a great deal of information about the professional firm that the client is considering appointing. No information is needed when

nothing has changed if it is an exact repetition of previous service.

For ease of reference, the three characteristics of buying situation are summarised in Table 2.

Type of buying Situation	Information requirements	Consideration of new alternatives
New purchase	maximum	Important
Repeat purchase	minimal	None
New service	maximum	Important

TABLE 2

Client Analysis

The service firm can start to analyse their individual clients either from its own history of success or failures in the area. If it is a new area, it can be examined from the characteristics of firms in the market segment. Clients may fall under any of these characteristics i.e. regular clients, irregular clients, lost clients, failed offers clients and refusals clients.

An examination of clients' characteristics for a service contract successfully obtained and fulfilled will provide an identification profile. Each specific client will need to be treated separately depending on which segment they are classified in. However, further critical questions should be considered against each segment.

Example :

Regular clients
- why is the client using our services regularly?
- how can we improve our service to them?
- what will happen if we lost the prospective clients?

Lost clients
- why are our services being discontinued?
- how can we improve the client relationship?
- what enquiries do we know that we have not been invited to tender?

Refusal clients:
- why have our services been refused?
- how can we improve our offer?
- what are the needs of clients?
- is the client getting better services from the competitors?

It is important to have a clear understanding of the clients and their relative roles in marketing. However, when a potential client is identified, it is essential to match their profiles against the firm's own resources. Partners or senior partners of a service firm normally make this decision. The profile of clients should be used as the basis for the choice and targeting of appropriate methods of communication.

Methods of Communication

For professional service firms, personal contact still represents the most popular method of obtaining commission (Ajanlekoko, 2000). Personal contact is still the most positive communication medium available to the professional today. In face-to face contact, one at least has the person's attention for a period of time. Whether meaningful information will get through to the listener depends only on his interests and the persuasiveness of the representation.

Clients generally prefer to buy professional services from the people who will be performing work for them rather than from marketing personnel who never provide services. When the professional is expert and informed on the subject of the services, clients will place more confidence on him. To ensure future purchases, it is important that this professional-client relationship is maintained throughout the entire service process.

When an enquiry is being pursued, the professional person must brief himself on the level of expertise that the client has on the service being purchased. Failure to take account of this level of expertise may cause a loss in obtaining commission from the prospective clients.

As for clients seeking professional services for the first time, they will usually seek advice from others more experienced. As such, personal recommendation is also an important method.

In recent development, the internet, specifically website is the latest form of communication for the professional firms. The effectiveness of this method, though not fully tested, should not be taken slightly (CSM, 2000).

Marketing Programme

A well-planned marketing programme will enable any organisation to gain better recognition in its market place and with its public. This will lead to an increase in the number of invitations to tender or to become involved in major projects and consequently an increase of the organisation's greater profitability. In order to achieve this, there are a few essential steps to follow (Aubrey, 1972).

1. Define the business objective. This is the aims that the company hope to achieve in the medium and long term. Be specific on the service offered and the limitation to that service.
2. Identify the market. Each professional firm has to identify their potential clients (private, corporate, institutional, etc). Be sure that the right marketing segments are being identified so as to ensure optimum use of marketing resources.
3. Identify the market techniques - to suit the different market segments.
4. Identify the firm's competitive services in terms of quality of marketing, price efficiency, financial strength etc. - What is the quality of the services provided by our firm? What is the quality of the competitor's services?
5. Customer behavior and their needs - analyse what are the customer's needs and convince the prospective clients to invest in the services.
6. Feedback and control - a control system operated through a marketing audit so as to ensure the marketing mix is kept in synergy with the target market segment and the company's own marketing objectives.

It must be always remembered that marketing of professional services is a "selling promise". This is the fundamental difference between services and goods (products) marketing. Services are intangible where there can be no demonstration without giving the service, warranty is difficult, samples and patent protection impossible

MEASUREMENT AND CONTROL

A control system operated through a marketing audit is essential to ensure the marketing mix is kept within target market segment and the company's objectives. The following key measurements are mostly employed to evaluate the service firm standard of performance:

1. Profitability - the ability of a firm to measure profitability in its marketing operations will vary with the firm's size, the complexity of its operations and the range of services offered. Cost control is a necessary operating objective of a firm. In order to achieve a firm's profit objectives, the firm should administer its expenditure to get the maximum results from the costs it incur.
2. Costs - a comparison of costs over a period of time is one of the traditional ways to measure and control performance.
3. Market share - the standard of measurement for the overall marketing efficiency is market share. A decline in total market share may lead to a smaller sales volume.
4. Sales - this is perhaps the simplest measure of a strategy's effectiveness and performance sales volume. The costs of achieving any given sales volume will determined whether a company should be in the market at all.

However, the effective control cannot be achieved unless information is available. Therefore, the flow of information between marketing planned and actual program must be communicated to all persons involved in the service company to ensure co-ordination of effort. Alternatively, critical information must flow back to the original person involved to decide if the marketing programme is following its actual market plan in terms of time and achievement.

The major difference between measurement and control in the marketing of professional services and in the marketing of product is largely one of scale. Professional service firms tend to be small, therefore, communication and awareness is usually high so the subjective assessment is often easy. However, the professional who can sell usually has an extensive knowledge of the service rendered and client problems. As such, these professional firms may tend to ignore simple methods of measurement and the application of formal controls.

CONCLUSIONS

The professional Quantity Surveying firms could not longer ignore marketing methods in their effort to increase their business opportunities in the increasingly liberalised service market. It is time for the professionals to acknowledge that marketing is not only advertising. It is a conscious act of understanding clients needs and requirements, analysing the buying situation, the competitors and the firm's own resources and skills. It is creating new services to cater for new requirement in the industry. It is looking at the firm's own technical expertise and whether it has the ability to penetrate new market segments to obtain a bigger share in the total market.

Employing marketing strategies will help in improving service performance which leads to better client satisfaction, improvement in efficiency of the firm and increase in productivity. It will also pushes a firm to move with the advancing technologies in the attempt to meet the requirements of new and sophisticated clients. This will benefit not only the individual Quantity Surveyor and the professional service firm but also the Quantity Surveying profession as a whole.

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GLOBAL OCCUPATIONAL COMPETENCE STANDARDS FOR PROJECT MANAGERS AND PROJECT CONTROL ENGINEERS

Richard Plumb, ACostE NVQ Chairman

ABSTRACT

This paper describes the concept, development and benefits for company and employees of the occupational competence qualifications specifically designed for all project managers and project controls engineers. Particular reference is made to the currently ongoing development of the new Global Standards and Qualifications such that in time to come, a common standard of competence may be held by practitioners from around the world. Current implementation successes in the UK and also trends for the future in the methods of assessment, are also considered in this paper

Keywords: competences, project managers, qualifications.

INTRODUCTION

Project Management is increasingly becoming an international activity and project teams are rapidly becoming multinational and multicultural. As we are all aware the efficiency of a team is dependent upon the levels of competence within each members occupational workscope. Additionally, the confidence of clients, partners and supply chains in and around the team is gained through operational effectiveness.

There is a general increase of awareness of the need for persons engaged in the business of project management to be auditable on all matters of expenditure and cost effectiveness in the use of resources. A major resource on any project is the use of the persons employed and particularly those in senior positions. A lack of performance on behalf of a senior individual can have a major effect on client confidence, achievement of project objectives and the enthusiasm and moral of fellow team members.

In this paper we will demonstrate the benefits of competence qualifications in project management occupations to companies and practitioners. Additionally, the current initiative to develop occupational standards for use all around the world, such that confidence in the project teams is truly international.

COMPETENCE

Competence is the ability to apply knowledge, understanding and skills in performing to the Standards required in employment, including problem solving and meeting change.

Simply described as "Can do" and not just "Knows how" and also proved by "Has done". National Vocational Qualifications (NVQs) are specifically a demonstration of a practitioner's complete ability to perform to the defined set of National Standards.

National Standards

Standards for Project Management and Project Controls occupations were created by teams of industry specialists both in the United Kingdom and Australia under the auspices of their respective governments. They took several years to compile and were accredited by the appropriate Government departments in 1996.

They are provided to industry through the approved Awarding Bodies, which are continuously audited and monitored by Department for Education and Employment officials, to ensure standards of delivery are maintained.

Implementation

Interest in the UK, Australia, New Zealand, South Africa, Europe and Hong Kong is growing all the time and we are now finding candidates coming from companies in industries not traditionally from construction or project management fields.

The British Standards for Project Controls NVQs have now been adopted by the South Africans and are to be offered as part of their own full syllabus through the Services Awarding Body. In the UK we have received many requests for these qualifications from overseas candidates.

In the past three years some hundreds of individuals have started these programmes and many of the earlier candidates have completed and gained their certificates from the Awarding Body. Since inception new methods of assessment and delivery have evolved and we are now implementing a method of electronic communication coupled with web based registration and learning such that distance becomes or little importance.

Although Project Management and Project Controls are traditionally construction disciplines we are finding candidates are joining the programmes from the Ministry of Defence and from the oil, gas, petrochemical, water, nuclear, heavy civil and information technology industries. Interest is also being shown by the shipbuilding and manufacturing industries.

NOW VERY QUALIFIED (NVQ)

Benefits to Employers

- With this qualification (in the UK called National Vocational Qualifications) employers can be assured that the individual has had experience of all aspects of his/her profession. Shell and BNFL have both stated that any persons applying for a position in their company will automatically be placed on a short list of applicants! Until now we have been all too familiar with the problems of recruitment through the CV and interview method and the resulting difficulties when later faced with a bad choice of individual who cannot do the job he/she was recruited for.
- Accountability to senior management in the qualification status of the project support office and the employment process.

Cost effective training by identifying an individuals gained experience against the Standards, shortcomings can be easily identified and work assignments given to give experience. Specific training can satisfy major areas of knowledge requirement. Previously it was necessary to send an individual on a general training course, which was costly in money and also time, since the candidate usually knew a proportion of the general course syllabus.

Benefits to an employee include

- Gaining a competence based professional qualification. Many persons in Project Controls and Project Management have through career opportunity, migrated to these positions from some other branch of engineering or profession. A new position needs a new demonstration of proficiency.
- Credibility with peers and management.
- Improved employment prospects
- Employees new to the profession can see the full scope of the knowledge to be gained from the National Standards and can measure their progress to being fully proficient.

Partnering and Alliancing

In these days of reduced teams of engineers, who need to be supplemented by skilled individuals from specialist companies for a specific project, it is necessary for all members of the combined team to have complete confidence and reliability in their peers.

Additionally the pre-qualification process of potential partners has the requirement for occupational competence qualifications.

Regulatory Bodies

In the United Kingdom occupational competence is now seen as going beyond the skills of an individual. The competence of the Client/Contractor/Supplier is now seen to be in question should an accident occur. All aspects of personnel functions and procedures are called into question and the "Regulator" can report on any appropriate or accountable aspects. At least now with these NVQs the occupational competence of the personnel cannot be doubted.

NVQs in Project Management or Project Controls

Project Controls is the generic title for the area of project management which covers project resource management, risk and contingency control. A Project Controls professional may be engaged in any of the cost estimating, cost control, planning or risk management activities. Generally such persons are found in project support offices, however, in some organisations or on some smaller projects it is often necessary for the project managers to carry out these functions themselves.

Due to the variations in company project management procedures and operating methods, the NVQ delivery process has been found necessary to include an investigation of a potential candidates job scope. As these qualifications are based upon candidates actual work activities, this analysis will determine the most appropriate qualification for him/her from the available Project Controls Level III or IV or the Project Management Level IV or V.

For information, I will describe the British system, which covers most of the occupations within the term Project Management.

Project Management NVQs

The scope of the Project Management level V, NVQ covers all the requirements of a Strategic Project Management role.

Nine Units covering the following topics

Develop Objectives
Specifying Requirements for Projects
Estimate Resources and Develop programmes
Recommend Contracting Arrangements
Secure Resources
Control Risks
Establish the Project Organisation
Control Implementation of the Projects
Evaluate Project Achievements

The Project Management Level IV qualification includes for all requirements of an Operational Project Manager.

Seven Units covering the following topics

Specify Requirements
Estimate Resources and Develop Programmes
Secure Operational; Resources
Manage Contractual Arrangements
Identify and Analyse Hazards and Control Risks
Guide Teams
Manage Implementation

Project Controls NVQs

Project Controls Level IV

This qualification is for fully practicing project Controls Engineers and has core and option subjects with four obligatory units and with two or three each for Estimators, Cost Engineers and Planning engineers as follows: -

Core Units are

Develop Objectives for Project Controls
Develop Procedures for Project Controls
Analyse Risks and Manage Contingencies
Obtain Feed Back and secure improvements

Optional Units

Estimating	**Cost Engineering**	**Planning**
Estimate Financial Resources	Estimate Project Resources	Specify and Schedule Project Resources
Provide Support to Contracts and Procurement Activities	Provide Support to Contracts and Procurement Activities	Support to Contra ct and Procurement
	Monitor and Control Project Cost Activities	Monitor and control Project Scheduling Activities

Project Controls Level III

This qualification is intended as a starter set for new persons into our industry It consists of four Core Units and one each for Estimators, Cost Engineers and Planning Engineers.

Core Units are

Contribute to the effectiveness of Work Activities
Support the Implementation of Procedures
Obtain and Utilise Data
Maintain Project Documentation

Optional Units are

Estimating	Cost Engineering	Planning
Assess, Evaluate and Estimate Resources	Implement Cost Procedures	Implement Schedule Activities

Certified Cost Engineer (CCE)

The Association of Cost Engineers (ACostE), under the auspices of the International Cost Engineering Council, has accepted the NVQ in Project Controls as meeting one of the constituent parts of the Certification Process. The NVQ has been accepted as meeting the first stage of the Certification process, following which applicants may then proceed to subsequent stages. Since its launch in November 2000, a number of British and overseas candidates have become registered and are now working through the process of Certification.

GLOBAL OCCUPATIONAL STANDARDS FOR PROJECT MANAGEMENT AND CONTROLS

At the Congress 2000, held in London in May by the International Project Management Association (IPMA) a meeting was held by interested persons to discuss the concept of Global Occupational Standards for Project Management and Project Controls.

This resulted in Lynn Crawford of the Australian Institute of Project Management (AIPM), being appointed Project Director and Richard Plumb of the ACostE becoming Project Manager.

Several meetings have since been held in the UK and we have now submitted our first thoughts on the concept, format and structure of these new global occupational standards to the international representatives for their comment and input. Some early funding for this project has been received from The Association of Cost Engineers, The Association for Project Management, British Energy, British Nuclear Fuels Limited and Roll Royce. These funds enabled a Business Plan to be prepared which was circulated to all those persons attending the Start Meeting at the IPMA Congress in May 2000

We anticipate that the completed work will include a matrix of the standards available from all the participating countries with one side being all the Project Management Occupations and the other providing depth of required knowledge and experience. Thus providing on a core and option basis a full set for all practitioners at various levels of experience.

It is targeted to produce the first draft of the Standards for field trials of the qualifications and later general acceptance in April 2002 at the International Cost Engineering Council Congress in Melbourne, Australia. It will also be first shown in Europe at the International Project Management Association

Congress in Berlin in May 2002.

This week in Hong Kong we are holding a mid term Global Standards meeting and many international delegates will take part. When completed this initiative will provide a common basis for benchmarking the performance of Project Managers and their support staff all around the globe.

Memoranda of Understanding

To provide a solid foundation on which to build the Global Occupational Standards and Qualifications it has been necessary to create various Memoranda of Understanding as follows: -

1. Between
   The Association of Cost Engineers and The Association for Project Management
   This will provide a basis for a combined development team.

2. Between
   International Cost Engineering Council and International Project Management Association.
   This will bring together the 70 plus organisations representing project management, project controls and cost engineering around the world, thus ensuring realistic and as broad a participation as possible.

3. Between
   To encourage government department participation and also subsequent acceptance of the standards and qualifications

British -	Qualifications and Curriculum Authority
Australian	National Standards and Training Authority
South African	South African Qualifications Authority
New Zealand	New Zealand Qualifications Authority

CONCLUSION

These qualifications are here to stay. They provide the necessary confidence for employers, client companies and individuals in the commitment and skills of themselves and those with whom they work. They also give an identity to the profession of project management and to cost engineering in the widest sense, which we never had previously. Now it is possible for an individual to point to the Standards and advise "That is what I can do and I do it well"

Remember - "Can do" and not just "Knows how".

Thank you. If any one wishes to know more about any aspect of these qualifications and their implementation, please contact me on

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THE ROLE OF GOVERNMENT IN SUPPORTING THE CONSTRUCTION INDUSTRY IN THE UNITED KINGDOM

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ABSTRACT

The construction industry is a vital part of a nation's economy contributing up to 10 percent of GDP. The industry is large and fragmented and often has not been a high priority for national governments. While this in itself is not a problem, it leaves the industry vulnerable in a rapidly changing marketplace. Recently, the UK government has recognised the importance of Construction Industry and has injected a large amount of capital in fostering change in the Industry. It is argued that by adopting a more innovative approach and improving links in the whole industry supply chain to undertake research and development the construction industry would be better placed to innovate and as a consequence capitalise on the challenges and opportunities presented by the national and global market. This paper considers the role of the UK Government in supporting the UK Construction Industry. It addresses the significance of construction to the government; examines the stated aims including priority areas of the UK Government's construction policies and presents the mechanisms that have been put in place to achieve these aims.

Keywords: Construction Industry, Government, Innovation

INTRODUCTION

In the past, the construction industry has focused on cost efficiency as the prime method of improving productivity. Cost efficiency provides a competitive advantage up to a point and can only be achieved incrementally. Advocates of change have recognised that cost reduction and rationalisation must eventually plateau as critical factors are placed in jeopardy by diminishing organisational, infrastructural and other resources. Innovation, on the other hand, can lead to larger scales of growth and provide the ingredients for increased competitiveness and can enhance competitive advantage exponentially. Innovation needs to be a corporate objective in construction organisations and for this to happen the demand for innovative approaches in the procurement of constructed facilities must come from the building clients. The government through a number of initiatives is requiring clients to change their procurement strategies and as a result force the construction companies to adopt more innovative approaches in the construction delivery process. In addition the government is providing leadership in driving a construction research and development agenda.

It has long been recognised that research and development drives diversification into technologically related areas that can improve an organisation's, an industry's and a nation's performance (Gold 1991) In nations with high labour costs, competitiveness critically depends on the way in which innovations are encouraged, developed and diffused. Moreover, to achieve maximum benefit from innovation it is

important that productivity improvements occur across a broad section of organisations rather than one or two organisations at the leading edge (CIDA 1995a). This requires substantial investment in research and development, undertaken by and accessible to the industry and its clients as a whole.

An OECD study conducted in 1991 revealed that many companies, nations and regions have strong programs to obtain and diffuse technological intelligence. In fact, the most technically advanced nations, whose organisations should be the most capable in the world and presumably be in the least need of assistance, have some of the largest programs to assist diffusion. Japan and Germany for example spend significantly more on research and development than any other nations (OECD 1991), with Japan spending $500 million US annually on innovation centres, while the annual budget of the German Farmhofer Institutes is around $550 million US. Interestingly, Singapore recently set up a centre focusing on the receipt and dissemination of new ideas and processes.

The importance of learning centres is taken up by Pavitt (1980) who argues that in line with the notion of 'centrality of learning', such centres provide a vehicle for the diffusion of innovation across the industry. Perhaps more importantly, Pavitt suggests that while the innovative product, practice or technology may be significant, the 'learning-curve' effect may in fact lead to developments that far exceed the initial impetus. This point is taken up by Eisenhardt (1989) who argues that the establishment of national centres focused on the diffusion of innovations and new organisational process is essential if general industry performance is to be raised.

Studies also indicate that the emphasis on research and development varies from industry to industry (Hambrick and MacMillan 1985). For instance, in the OECD funded countries since 1973, the rate of growth of business funded research and development activities in sectors such as electronics, aircraft and chemicals has increased to levels where some company's expenditure on research and development is greater than their investment in process equipment and plant (OECD 1991). This is reinforced by a comprehensive study of nearly 5000 technical innovations in large and small organisations in 1988, which found that traditionally innovative sectors (eg. electronic computing equipment, process control instruments, pharmaceuticals) 'produced' approximately four times more technical innovations than less innovative sectors (eg. fabricated metal products, industrial trucks and tractors) (Acs and Audretsch 1988).

Role of Government

Since the early 1990's UK government has acknowledged the difficulty that the Construction Industry faces in fostering research and development.

As a major owner and user of constructed facilities the government has a role to play and perhaps took the lead from some of the large multinational corporations. The Royal Dutch Shell Group, for example, recognised innovative research and development as a critical success factor in the early 1980s (Bienayme 1986). The group acknowledges the importance of setting aside a proportion of any research and development budget for the purpose of identifying and assuring the continuous transfer of scientific discoveries into business. It also recognised the importance of having a centre focused on transferring knowledge (Bienayme 1986). The government is the only construction client entity to have the motivation and resources to follow Shell's lead. The government must provide the leadership if barriers to industry improvement are to be removed. (CERF 1996).

In a study conducted by the Construction Industry Institute (1996b) it was established that the exchange of knowledge and transfer of technology within the project team had the potential to promote innovation and improve established practices. It was concluded that owners were crucial to the organisational and project team learning process as they could often introduce new processes and technologies developed on past projects. This is particularly true of government clients who should be active in transferring knowledge.

Government clients generally have a major role to play both at the project and industry level (BCA 1992; Ireland 1992). However, such clients in the past rarely regarded the constructed facility as integral to the enterprise and as such, do not view investment in possibly risky innovative ventures as warranted. Moreover the fact that construction is only a small percentage of total project costs meant that such clients were reluctant to invest in new construction processes and technologies. As a result of the government initiatives outlined below change has occurred and government construction clients are leading the innovation process in the construction industry.

CONSTRUCTION'S PLACE IN THE UK GOVERNMENT

The government department responsible for UK construction is the Department of the Environment, Transport and the Regions (DETR). The stated aim of the DETR is to:

> 'Improve the quality of life by promoting sustainable development at home and abroad, fostering economic prosperity and supporting local democracy.'[i]

The DETR has a diverse portfolio. It is made up of several 'Groups' with a wide range of policy responsibilities, these are:

- Environmental Protection
- Housing, Construction, Regeneration and Countryside
- Local and Regional Government
- Railways, Aviation, Logistics and Maritime
- Transport Strategy and Planning
- Strategy and Corporate Services

The R&D expenditure on construction by the DETR is shown in the table belowii. This is a significant proportion (20%) of the departments R&D spending. The breakdown of the department's total spending is also shown.

Within the DETR, Construction forms part of the Housing, Construction, Regeneration and Countryside Group, each element of which forms its own 'Directorate'. While the Housing and Regeneration Directorates have a large influence on the UK Construction Industry it is the Construction Directorate that is responsible for government construction policy. UK construction had a turnover of ¢G58 billion in 1997 - about 7% of GDP - and employment approaching 1.5 million. The aims and priority areas of the Construction Directorate are as follows:

'The main aims of Construction Directorate are to improve quality and value for money from construction, both for commercial and domestic customers, and to modernise construction methods and procedures. Improved training and employment practices are a priority and the Directorate is delivering a Welfare to Work training program which is unique to the construction industry. The Directorate supports a programme of innovation and research as a further means of improving the industry's performance and of promoting more sustainable construction. The Directorate also has a specialist Export Promotions Unit and is responsible for building regulations - working closely with the Health and Safety Executive to improve the safety of all those constructing or occupying buildings.'[iii]

What then, is the thinking informing the Construction Directorate in its desire to promote these aims? There are two main strands to the Directorates policies.

Department of the Environment, Transport and the Regions: R&D and SET expenditure by subject area (£ million)

	Outturn 1998–99	Estimated outturn 1999–2000	CSR plan 2000–01	CSR plan 2001–02
DETR (Central)				
Construction	26.5	25.3	25.3	25
TOTAL R & D	132.4	145.4	162.4	171
Technology transfer	22	25	28.7	28
TOTAL SET	154.4	170.4	191.1	199

Department of the Environment, Transport and the Regions: Destination of R&D expenditure (£ million)

	Outturn 1998–99	Estimated outturn 1999–2000	CSR plan 2000–01
Total Gross Expenditure of which:	133.2	146.9	164
Intramural	9.4	9.8	9.9
Other government departments	14.4	21.3	21.8
Research Councils	5.6		
Local authorities	0.7		
Higher education institutions	14.8		
Private industry/public corporations	87.4	115.8	132.2
Overseas	0		
Others	1		
less receipts	0.8	1.5	1.6
TOTAL NET EXPENDITURE	**132.4**	**145.4**	**162.4**

Building a Better Quality of Life: A Strategy for More Sustainable Constructionvi

Sustainability is mentioned specifically in the aims of the DETR and so is an important element of the overall construction strategy.

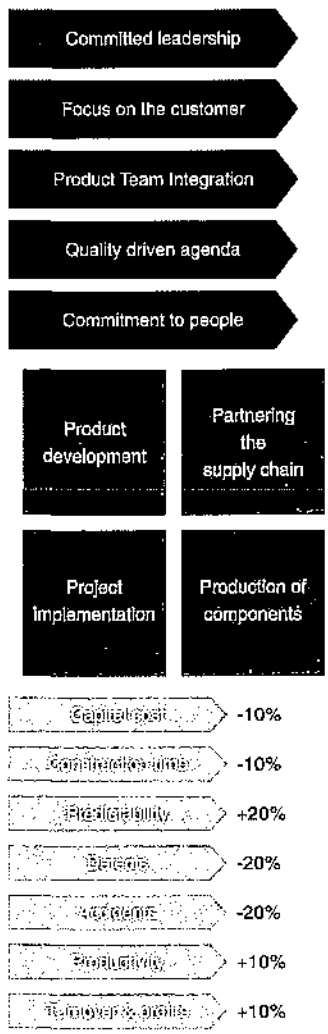
> The objectives of this Strategy are:
> to promote awareness and understanding of sustainable construction
> to set out how the Government expects the construction industry to contribute to sustainable development
> to show how Government policies will help to bring about change
> to stimulate action by individual businesses to set, and monitor their progress towards, targets for more sustainable construction which require continuous improvement. iv

Despite the high profile of sustainability within the DETR aims and objectives, this strand has a lower profile within the industry at large, than the second strand which is detailed below.

Rethinking Construction - The Report of the Construction Task Forcevii

This report, written by Sir John Egan, is the key to the policies that the UK government is trying to promote in the construction industry. It describes how at its best the UK construction industry is excellent, however, taken as a whole the industry is underachieving. The report concludes that radical changes are required to deliver real improvements throughout the industry. It outlines five key drivers for change, four key integrated project processes and proposes seven targets for improvement. This has become known as '5-4-7':

5 Key Drivers for Change
4 Project Process Improvements
7 Targets for Improvement



The targets set out in the report are ambitious. Many of the Departments other strategies and policies are informed by this report and sustainability, though not mentioned specifically in the above table is an integral element.

Having considered the aims of the DETR and the Directorate of Construction, the next stage is to consider the mechanisms that have been put in place to achieve these aims.

RESEARCH FUNDING

The main source of research funding for construction in the UK is the Engineering and Physical Research Council (EPSRC). EPSRC is the largest of the seven research councils responsible for promoting and supporting basic, strategic and applied research for the UK.

The UK research councils are autonomous, non-departmental public bodies principally funded from the science budget received from the Office of Science and Technology, part of the Department of Trade and Industry (DTI). The Construction Innovation and Research Management Division (CIRM) of the DETR also contributes to the collaborative programmes for construction research run by the EPSRC. The EPSRC support research, study and training in universities and other higher education establishments, their own institutes and international research centres and are currently funding 90 construction related research projects with a total value of ¢G11.8 million.

In addition to contributing to the EPSRC research programme the CIRM supports construction innovation and research with the stated aim of 'improving the industry's competitiveness, quality and performance, while enhancing health and safety, the environment and the quality of life'.

The CIRM construction research programme is structured into five business areas; Technology and Performance, Construction Process, Motivating Change in the Industry, Environment and Safety and Health. Their research priorities have been developed in consultation with industry and reflect the recommendations of the Construction Research and Innovation Strategy Panel (CRISP).

The CIRM run a major collaborative scheme with industry called "Partners in Technology" (PII). By its nature PII projects tend to be less 'blue sky' than EPSRC funded projects. PII is a collaborative scheme providing up to half the cost of research and innovation projects within the construction sector. It is open to all UK companies, industry bodies, institutions, research and technology organisations and universities. The PII 2000 budget is ¢G7.5 million, which is sufficient to support around 100 new projects on a cost-shared basis.

RETHINKING CONSTRUCTION

There are six national bodies responsible for the implementation of the Rethinking Construction objectives. These are:

- The Construction Industry Board (CIB)
- The Movement for Innovation (M^4I)
- The Construction Best Practice Programme (CBPP)
- The Housing Forum
- Local Government Task Force
- Government Construction Client Panel

In addition regional bodies such as the Centre for Construction Innovation (CCI) are being established to progress the 'Rethinking Construction' initiative throughout the United Kingdom. CCI has been set as the model for a regional centre.

The Construction Industry Board (CIB)

The Construction Industry Board (CIB) exists to improve the performance of the UK construction industry. It brings together suppliers and customers from the private and public construction sectors with central government. Its main objectives are to implement the recommendations of Sir Michael Latham's 1994 report 'Constructing the Team' and the complementary agenda of the 1998 Egan Report

'Rethinking Construction'. The CIB provides strategic leadership and guidance to the other groups within the Rethinking Construction movement.

The Movement for Innovation (M⁴I)

The M⁴I was launched on 3 November 1998 to facilitate the cultural change required to achieve the improvements called for in 'Rethinking Construction'. Its mission statement and strategy are:

"The Movement for Innovation (M⁴I) aims to lead radical improvement in construction in value for money, profitability, reliability and respect for people, through demonstration and dissemination of best practice and innovation.

To deliver these goals our strategy is that:

We will bring together clients and all involved in the construction supply chain, in innovation, best practice, or research, who are committed to change and innovation in construction

We will provide leadership, share experience and work together to create an open, co-operative, no-blame, non-adversarial, team approach to innovation.
We will drive forward by example and persuasion the changes needed to create an industry in which the norm will be committed leadership, a focus on the customer, a process and team integrated around the product, a quality-driven agenda, and a commitment to and respect for people.
We aim, through sustained improvements and innovation in product design and development, in project implementation, in partnering the supply chain and in production of components, to facilitate delivery of the enhanced performance targets set out in "Rethinking Construction".
We will test, measure, quantify and disseminate experience and achievements from demonstration projects through the Construction Best Practice Programme and the Knowledge Exchange in the form of case histories, toolkits and guidance notes". [viii]

The Demonstration Projects are at the heart of the Movement for Innovation and provide the seedbed where ideas and innovations are put to practical use and measured. Demonstration Projects comprise building and specialist civil engineering projects which have been accepted by the M⁴I as potentially demonstrating some or all of the innovations advocated in 'Rethinking Construction'. Projects provide the case study material which is made available to the rest of the industry to illustrate the opportunities and practical measures to improve the performance of the construction process in the UK. Demonstration Projects demonstrate one or more, or all, of the following:

- Measures that improve product development
- Measures that improve project implementation
- Measures that improve partnering in the supply chain
- Measures that improve the production of components

Demonstration Projects may also demonstrate innovations to improve the sustainability of construction processes and enhanced levels of competence in management, supervisory and craft skills. In all cases the impact of the innovations will be measured.

For the M⁴I to be effective it is vital that the projects are widely disseminated. The M⁴I now has a portfolio of over 170 projects the dissemination of which is done in two ways. Firstly those project teams involved in individual Demonstration Projects are invited to share their experiences with other Demonstration Project teams. This is organised on a regional basis. This process is seen as helping to consolidate the process of sharing information amongst those who have already demonstrated their commitment to the principles of "Rethinking Construction". More generally the intention is that the Demonstration Projects and the innovations demonstrated are publicised through the M⁴I website.

The Construction Best Practice Programme (CBPP)

The CBPP is jointly supported by the DETR and the Construction Industry Board. It publicises and supports the use of improved business and management practices for the UK construction industry. Registration with the CBPP is free. The publicising of these good practices is done in the following ways for companies that have registered with the scheme.

- Guidance and supporting information presented in text or visual format, whether paper-based, electronic, video or CD ROM. This comprises over 400 free and priced guides, case studies, websites, reports, company profiles and news items produced by the Programme or other organisations.
- Seminars and conferences. In addition to running their own events the CBPP promotes seminars and workshops by other organisations with an interest in the Rethinking Construction agenda
- Visits to best practice companies through the Inside UK Enterprise scheme
- Tools and assessment techniques for improving business processes
- Links to advisory organisations for specialist help in implementing change

The Housing Forum

The Housing Forum covers all aspects of housing both in the public and private sectors, including; refurbishment, maintenance, installation and new build.

The purpose of the Housing Forum is to bring together parties involved in the house building supply chain who are committed and ready to become part of a movement for change and innovation in construction and renovation. The Housing Forum therefore includes leading edge suppliers, house builders, social landlords, local authorities, designers, contractors and consultants seeking to improve continuously quality, efficiency, sustainability and value for money. The Housing Forum works in parallel with relevant trade bodies and professional institutions.

Just as for the M^{4}I, housing specific demonstration projects are central to the work of the housing forum. The housing forum currently has 86 demonstration projects together with working groups on:

- Sustainability
- Customer Satisfaction
- Recruitment, Retention and Respect
- Refurbishment (In conjunction with the LGTF)

The Local Government Task Force

The Local Government Task Force promotes Movement for Innovation construction principles among local authorities which, together with central government, represent some 40% of the construction industry's business.

The Central Government Task Force

The Central Government Task Force (CGTF) is chaired by HM Treasury and is made up of representatives of major Central Government Client Organisations, such as Government Departments, agencies and bodies at Chief Executive level and is one of the four strands of the Rethinking Construction initiative. It acts as a pathfinder and leads on best practice for government clients.

In addition to these six organisations that formally come under the Rethinking Construction umbrella there are several other related organisations that could be discussed . One that is of particular note is:

The Information Technology Construction Best Practice programme (ITCBP)

The ITCBP is an autonomous subset of the CBPP. The establishment of the ITCBP is an acknowledgement that the appropriate use of IT is vital for construction companies intending to meet

the Egan targets set out in 'Rethinking Construction'. As per the CBPP the ITCBP operates a free registration scheme. Registered member companies receive similar benefits as members of the CBPP, specifically:

'How-to' guides
Easy-to-follow practical to help you adopt IT best practice in a number of critical business areas

- Case studies
  Step by step accounts of how organisations have obtained benefits from implementing IT best practice.
- Self-assessment tools
  This will help you to analyse your business needs and identify how IT can contribute to meeting them. It will also allow you to measure your progress in the use of IT*

All of the above bodies and organisations are national organisations' albeit that they have established regional networks throughout the UK. The DETR is now funding regional centres to help in the work of co-ordinating and disseminating activities to the regions.

Centre for Construction Innovation (CCI)

One such regional centre is the Centre for Construction Innovation (CCI) based in Manchester in the North West of England. The CCI's task is to assist the construction industry in the North West in the task of Rethinking Construction. It has the ability to harness all of the work that is being done nationally, both research and industry based, and develop it to suit the needs of local industry. It will do this not only by the conventional means of education, training and research but also in a more fundamental way. Although the national organisations are capable of providing much of the tools and information required for companies to become innovative they cannot engage with companies in the regions in the same way as a locally based organisation can. The CCI is bringing together a broad range of local industry participants and academics as active partners to provide the knowledge and tools to create an environment that fosters innovation. It is this participatory environment that is vital to bring about the cultural change required to create innovative organisations, as any learning process is an active rather than a passive task.

CONCLUSIONS

There is no doubt that the UK government's agenda for change in the construction industry is having a positive effect. This is shown by the number of companies actively participating in the M4I, CBPP, ITCBP etc. Implicit in any collaborative arrangement is a sense of, and desire for, fundamental improvement. The development of research and development consortia are means to facilitate this largely because it calls on stakeholders to look beyond the scope of an individual project and to establish how the project procurement process can be improved exponentially. By looking beyond individual projects an innovation strategy requires an appraisal of current and future processes and systems relevant to particular projects, and, indeed, the stakeholders in general. A fundamental requirement is that the government as a major industry client provided the leadership for industry improvement. The number of case studies and demonstration projects that organisations develop in conjunction with M4I and CPBB provide convincing evidence that embracing the government agenda can produce business benefits. Also the number of companies embracing Partnering and other Egan principles is encouraging

However, projects, organisations, people and contracts do not exist in a vacuum; they are embedded in a variety of industrial, social, legal and other contexts that determine what is possible and, often, what is desirable. The collaborative process, then, is a matter of inter- and intra- organisational cultural assessment and development. The processes, habits and techniques of organisations, as well as all

those indefinable features of group life that give an organisation its identity comprise its culture — its personality, so to speak. Likewise, the interaction of organisations reflects industrial and other cultural factors. In establishing a working relationship, participants endeavour to shape a new and more profitable culture that will define their interaction. They are explicitly accepting the need to do things better and smarter — and more cooperatively. No ventures can succeed without a favourable cultural backdrop. The commitment of all, and in particular, senior management is an absolute necessity. The government through the DETR is encouraging the formation of regional centres such as the Centre for Construction Innovation to provide the cultural backdrop for change. These regional centres have well developed communication strategies that keep the momentum going.As an agent of organisational change, then, collaboration between a regional centre and industry participants can be a powerful technique. First, it focuses on the regional need of the respective organisations to succeed together in a potentially hostile external environment — after all, if there were no perceived threats to organisational success, why make more commitments than one is legally obliged to? Second, by addressing specific research projects the collaboration is grounded in reality rather than mere wish fulfilment. Third, internal organisational change is driven by interaction with other parties operating under similar conditions and the need to adapt; the frame of reference for change is established by necessity rather than convenience

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ESTABLISHING A SYSTEM FOR THE PROFESSIONAL CERTIFICATION OF COST ENGINEERS

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ABSTRACT

The need for an internationally recognised Cost Engineer has arisen from the trend towards globalisation resulting in projects being undertaken across borders all around the world. Contractors and clients employ cost engineers from a variety of countries but until recently have had no means by which the professional capabilities of these could be meaningfully compared. To address this issue the International Cost Engineering Council (ICEC) instigated the Certification process for Cost Engineers. This paper discusses the issues involved in the development and administration of an internationally recognised scheme of Certification for Cost Engineers. Consideration was given to the fundamental question of whether a need existed for such a qualification. Having accepted its validity it was necessary to establish the value that the Certification qualification would hold, together with its future possibilities. Ensuring equivalency to the schemes of other member bodies whilst ensuring that it was accountable yet workable were issues that required considerable development before the scheme could become operative in November 2000.

Keywords: certification, cost engineering, equivalency, standards,

THE NEED FOR AN INTERNATIONALLY RECOGNISED PROFESSIONAL QUALIFICATION FOR COST ENGINEERS.

The need for a qualification that certifies the professional capabilities of cost engineers has grown over a long period of time, it has become more important recently with the growth of international contracting, fueled to a considerable extent by globalisation. Employers and clients were faced with the situation of employing cost engineers for projects from around the world, each with recognised national membership of their respective professional body. The issue was how to compare the professional qualifications from each of the member bodies were equivalent? The various professional qualifications, whilst equivalent in status, were not necessarily comparable with respect to areas of expertise and capability. In addition there was little information available in an objective form to guide potential employers and clients in their decision making. The problem was further compounded by the number of professional bodies involved. It became evident that it was not possible to rank the equivalency of professional cost engineering qualifications with any certainty. Employers, clients and cost engineers themselves needed a qualification that was internationally transferable, recognised as equivalent and which related specifically to the professional capabilities being sought in the cost engineer.

To address this need the International Cost Engineering Council (ICEC) instigated the Certification of cost engineers, to provide an internationally recognised and comparable qualification that would

provide recognition of an individual's particular professional capabilities. ICEC issued guidelines for certification with the objective of ensuring that certification by any and all member bodies would be to the same consistent objective standard (ICEC, 1990).

The ICEC Guidelines ICEC (1990) defined four major purposes for certification.

a. To raise the professional standards and improve the practice of cost engineering and project management by giving special recognition by their peers to those who, in fulfilling prescribed standards of performance and conduct, have demonstrated and maintained a high level of competence and ethical practices.
b. To identify for employers, clients and the public, persons with broad knowledge of and capability to professionally apply, the principles of cost engineering and project management.
c. To establish a continuing program whose goal is the improvement of individual cost engineering and project management skills an professional development.
d. To clarify the body of knowledge and standards of conduct for the practice of cost engineering and project management.

ICEC ensured that primary amongst these was the development and improvement of the knowledge and practice of cost engineering, which was envisaged to be a continuous process with the establishment and maintenance of the Certification programmes. In purpose b. the Guidelines identified the specific benefits to employers and clients offered by Certification.

An internationally recognised qualification for cost engineers offered tangible benefits to cost engineers, employers and clients. To the cost engineer a route became available by which they could obtain an internationally recognised qualification that certifies their professional capabilities, a definite advantage when working across borders. Probably more important are the benefits to potential employers and clients, who would now be able to objectively evaluate cost engineers from different countries against their own known and stated requirements. Greater certainty in the appointment of one group of key personnel on a project is clearly desirable.

DEVELOPING OF THE UK SCHEME OF CERTIFICATION

Whilst ICEC established the overall scheme for Certification, it is incumbent upon each country's professional body of Cost Engineers to devise and administer a scheme to meet the requirements of the ICEC scheme, and thereafter to ensure that any member who obtained Certification was of an equivalent standard to any other Certified Cost Engineer.

The development of the UK scheme of Certification involved a considerable gestation period, commencing in 1994 and not achieving recognition from ICEC until 1998. During this period the Certification Board was established to develop a scheme that would meet the requirements laid down by ICEC, whilst at the same time being practical to operate from the Association's perspective and maintainable for the foreseeable future. The first task facing the Board was to determine the form and format for the Certification process. Benchmarking studies of the processes used by other professional bodies to determine professional competence were examined and evaluated, with the aim of identifying the best processes in their entirety, as well as the best constituent parts of these processes. These were considered at length and informed the development of the UK process in many significant and important ways. After a process of development and consultation the format for the UK scheme emerged, this is shown schematically in Figure 1.

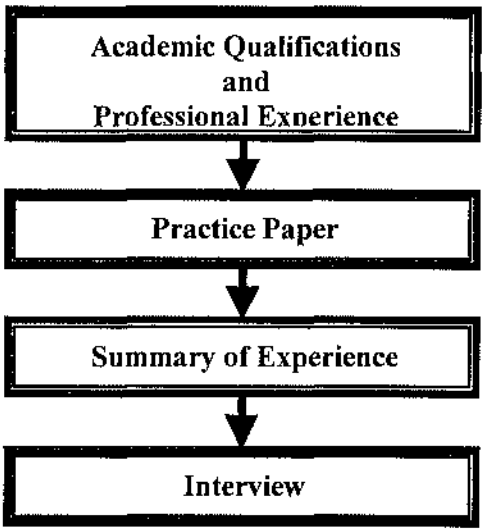

Figure 1. Certification process

The scheme comprises four stages of assessment, each of which must be successfully completed in progression.

The stages of the process resulted from the deliberations given to defining the criteria of assessment against which each candidate would be evaluated for Certification. The definition of these criteria not surprisingly, proved to be the most crucial aspect of the development process, fundamental questions relating to how to measure professional capabilities had to be addressed in a way that was as objective as possible and could be undertaken consistently.

In addition the need for accountability had to be accommodated, primarily as a means of assuring quality but also to permit objective scrutiny to ensure that the standards adopted would remain relevant, but also to ensure there was comparability with the Certification of other member bodies. Ultimately the criteria of assessment were a mix of professional experience, academic qualifications, in-work development and intellectual abilities, particularly with respect to the ability to possess and apply knowledge to cost engineering situations. Central to the assessment was the defined 'body of knowledge'. As part of the requirements to achieve Certification laid down by ICEC was the development of a detailed document specifying the 'body of knowledge' or 'minimum level of skills and knowledge' required by a practitioner, these provided a set of parameters for the assessment of the knowledge required in each specialty area.

In parallel with the development of the Certification process was the development of a series of evaluation and assessment standards. These would ensure that assessments would be consistent and fair for all candidates, irrespective of the time of the assessment or the persons charged with assessing, these would also support the process of quality assurance and scrutiny. The Certification process is administered by the Certification Board on behalf of the Council, assessment is undertaken by a panel of three, comprising a chairman plus two assessors. The role of the chairman is to ensure that the process of evaluation has been properly undertaken and that the candidate has been fully and properly assessed. The assessors are selected for their experience and expertise in cost engineering particularly in the field of expertise of the candidate.

MAINTAINING CERTIFICATION STATUS

Certified Cost Engineer status is intended to signify current professional capability, consequently the Certification is valid for a fixed period, usually three years but a maximum of five years after which

the individual must apply for re-certification. Similarly, there is a requirement for the evaluation process and the body of knowledge to be kept up to date, which would also imply that the assessors must also be subject to continuous improvement and updating. The issue of maintaining Certified status touches upon the related issue of continuing professional development (CPD), the two are considered separately by the ACostE, possibly because the requirement applies to all qualified members of the Association not just the Certified ones. Invariably Certified and non-certified cost engineers will undertake CPD as a requirement of continued membership and it is inevitable that this is considered as a contributory part of the re-certification process. At the present time the re-certification process has not been finalised, but it is expected that those cost engineers who attain Certified status maintain their expertise at the forefront of development.

COMPARABILITY

Equivalency remains the outstanding concern of the Certification Board, equivalency with the objective standards laid down by ICEC but also equivalency with Certified Cost Engineers approved by other member bodies of ICEC. Consideration has been given to establishing a formal benchmarking process that would ensure comparability on a regular basis. It is an issue that the ACostE intends to raise with ICEC at an appropriate time once the Certification process has bedded in.

The objective of ensuring comparability and maintaining standards within the process and across countries raises the issue of who certifies the certifiers. This is an issue that has been encountered by all bodies that certify the professional competence of their members. The ACostE took a multi-faceted approach to the issue, initially the careful selection of panel members appropriate to the candidate's area of experience and expertise will go a long way to assuring the quality of assessment. A programme of continuous development for certifiers would be implemented to keep them current in the principles and practice of assessment. In addition, it is expected, and indeed incumbent, upon the individual certifier to remain at the forefront of developments in their particular specialty, so that they are able to assess candidates for Certification fully from a position of expertise. Overlaying these initiatives will be a system of review, probably as part of the international benchmarking of standards being considered, which would provide feedback relating to the performance of the certification process and the certifiers. Accountability also plays a part in this process, as part of the Certification process there is an appeal procedure open to unsuccessful candidates, this would be undertaken independently of the Certification panel that made the original determination and offers a check against errors or misadministration. It is a more difficult matter to question and overturn the evaluative decision of the Certification panel, delivered in all probability in good faith and based upon the evidence presented to them. It is these appeals that will exercise the review panel more than any others.

THE RELATIONSHIP BETWEEN CERTIFICATION AND OTHER QUALIFICATIONS

Before establishing the need for another qualification, considerable thought was given to its status in relation to other already established professional qualifications. In the UK those of the Engineering Council were the most prominent, with the Association of Cost Engineers (ACostE) being a member of the Engineering Council. The Certification Board and the Council of the ACostE gave this issue some considerable thought, Certification not being a qualification of the Engineering Council and should not be directly compared to these. However such comparisons would inevitably occur and it would be necessary to indicate where it would stand in relation to the established qualifications of Chartered Engineer and Incorporated Engineer. Direct comparison was difficult at best and questionable in other respects with the issue of whether there should be a comparison at all and if so whether it

would be valid occupying considerable debate, eventually it was agreed by the Council of ACostE to regard Certification as between Incorporated and Chartered Engineer, however this is a difficult position to defend, as many of those seeking Certification already hold Chartered Engineer status. The two qualifications are in reality addressing different aspects, Certification seeks to certify the professional experience and abilities with respect to particular aspects of cost engineering, whilst Chartered Engineer covers broader academic and applicational aspects.

The relationship between other professional qualifications and Certification is an equally involved one. Certification uses these other qualifications as part of the evidence of the capabilities of the applicants, professional and academic qualifications providing evidence of the academic abilities of the applicant, which constitutes one facet of assessment in the Certification process. The question of relative status is really a non-issue, Certification co-exists alongside other professional qualifications without conflict or contradiction.

SUMMARY

The need for an internationally acceptable cost engineering qualification has been recognised and it provides clear benefits to those cost engineers who become Certified Cost Engineers. It is also of benefit to employers and clients, who have for the first time a comparable qualification upon which to assess cost engineers for their projects. The UK scheme of Certification has developed to meet these needs, but retains quality assurance and equivalency as its key influences.

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MANAGING QUALITY IN SMALL AND MEDIUM SCALE QUANTITY SURVEYING PRACTICES

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ABSTRACT

This study investigated how small and medium scale quantity surveying practices in New Zealand should manage quality (Q). It finds that there is a lack of knowledge in Q concepts and that there is a need to introduce a quality culture in QS practices. Q problems, the accompanying reasons, and solutions as perceived by quantity surveyors are presented. This 'three-step process' is considered as being capable of providing a simple but effective approach to the 'how' Q management. However, it is argued that this process lacks a focus on Q. Given that these QS firms do not see any value in using a certified quality management system, this study investigated whether the eight principles of quality management, successfully balloted for adoption by the ISO could be used. Investigations reveal that these principles are easy to comprehend with the exception of one and that these are relevant too except for two principles as perceived by the quantity surveyors. Having examined the differences between large and small businesses, this study finds that these principles (which explains the 'what' of quality management) could be used by QS practices to manage Q but argues that it falls short in showing how to implement these principles. Through this understanding, the authors propose a conceptual model for managing Q by integrating the 'how' and 'what' aspects quality management. This study also explains how this model could be utilised to implement QM noting that there is a need for further research to refine this approach.

Key words: quality, small businesses, quantity surveying, service industries

QUANTITY SURVEYING FIRMS IN NEW ZEALAND

A feature that characterises quantity surveying (QS) firms in New Zealand is their smallness. According to Wilkinson (1997) most firms employ less than 6 people and the number of small quantity surveying are on the increase. These firms cater mainly for a domestic market whilst offering a wide variety of services (NZIQS, 2001). These firms do not see any value in using an ISO9000 certified quality management system (Wilkinson, 1997). One wonders therefore what procedures and practices may be in place to manage quality. In fact, this concern forms the basis of this research.

QUALITY AND QUALITY MANAGMENT

Quality

"US leaders are focussing today on quality to restore the country's competitive edge. We know that an emphasis on quality improves overall productivity and reduces costs... As a nation, we used to think

just the opposite, that quality costs, that you have to create products of high quality. As a result we emphasised productivity at the expense of quality and began to loose many of our customers as competition increased." (Squarez, 1992). Although a sentiment shared almost a decade ago, this nevertheless highlights the importance of quality at the highest level. Whilst some nations are still grappling with this issue, it appears that Japan and the US in particular have made quality a 'way of life'. Indeed, quality has revolutionised the way people think and act globally.

Quality Management

How should such concepts be used in business? Quality gurus such as Crosby, Deming, and Juran who spearheaded the 'quality revolution' have proposed their own approaches of managing Q. Many others have proposed countless other approaches with volumes of material written about these approaches, so much so that users are left confused when having to select an appropriate approach that works for them - a phenomenon which may be referred to as 'total quality paralysis'(TQP).

The Golden Eight

One way of dealing with TQP is to 'discover' or 'synthesize' a set of statements about quality management that can be considered to be universally true. Such statements are called 'laws' or 'principles' in research jargon (Babbie, 1986, pp. 36-37). In this regard, a successfully balloted series of statements on quality published by the International Standards Organisation in mid 1977 are noteworthy. Labelled as the 'Eight QM Principles', these laid the foundation for the recently published ISO 9000:2000 Standard. Additionally, these are considered to be useful for leading and operating an organisation aimed at continually improving performance over the long term by focussing on customers while addressing the needs of all other stakeholders (ISO/TC176?SC2/WG15). More importantly, this study investigates how these apparently simple and concise principles (listed below) may be used in managing quality in small and medium scale QS firms.

Table 1: The Eight Quality Management (EQM) Principles

	Principle	Description
1	Customer-Focused Organisation	Organisations depend on their customers and therefore should understand current and future customer needs, meet customer requirements and strive to exceed customer expectations.
2	Leadership	Leaders establish unity of purpose and direction of the organisation. They should create and maintain the internal environment in which people can become fully involved in achieving the organisation's objectives.
3	Involvement of People	People at all levels are the essence of an organisation and their full involvement enables their abilities to be used for the organisation's benefit.
4	Process Approach	A desired result is achieved more efficiently when related resources and activities are managed as a process.
5	Systems Approach to Management	Identifying, understanding and managing a system of interrelated processes for a given objective improve the organisation's effectiveness and efficiency.
6	Continual Improvement	Continual improvement should be a permanent objective of the organisation.
7	Factual approach to decision making	Effective decisions are based on the analysis of data and information.
8	Mutually beneficial supplier relationships	An organisation and its suppliers are interdependent, and a mutually beneficial relationship enhances the ability of both to create value.

(Source: ISO/TC176/SC2/N376 dated 30.6.1997)

As mentioned earlier, the eight principles listed earlier explain 'what' quality management is. However, these do not explain 'how' these principles could be used for managing quality other than to provide some guidance. This distinction between 'what' and 'how' of QM is clearly brought out by Yusof and Aspinwall (2000) in their review of implementation frameworks for total quality management.

Quality and Small Businesses

Small businesses have a major impact on the economic life a nation as they employ a substantially large percentage of the private work force of a country and are also instrumental in creating a large amount of new jobs (Moore, 1993; McAdam and McKeown, 1999). As such, the manner in which these organisations are run is of much concern. Clearly, these organisations should be efficient and effective and should attempt to improve themselves continually with a customer focus. No doubt, managing Q is imperative for achieving these objectives.

What is a small (and medium scale) business with respect to how quality should be managed? Whilst studies in the US appear to have classified such organisations as having fewer than 500 employees (Elmuti and Kathawala, 1999) studies in the UK appear to have based this decision on a figure of 100 (McAdam and McKeown, 1999). By these standards almost all QS firms in New Zealand would be classified as small.

In order to understand how quality could be managed in small businesses it is useful to understand the differences between large and small businesses. According to Vickers (1990) as quoted in McAdam and McKeown (1999), small organisations display a flatter management structure, low profit margins and cash flow problems, little emphasis on training and development, high turnover of key personnel, informal and/or irregular quality controls, dependency of a single client or narrow customer base, lack of purchasing muscle, vulnerability to competition, flexibility to change rapidly, lack of long term strategic focus, and lack of in-depth resources. Similar views have been expressed by Yusof and Aspinwall (2000) who have pointed out that some of these characteristics can encourage the process of implementing quality management whilst others can hinder it. For example, these authors claim that whilst characteristics such as a flat structure, high flexibility, unified culture, the less bureaucratic and non system-dominated structure, and people domination could be conducive to the implementation of QM, characteristics such as inadequate financial resources, ad hoc and small scale training and staff development, high degree of control/autocracy of owners without sufficient delegation, lack of proper systems for decision making (for example by using 'gut feeling'), can hinder it.

What then must be done to make QM a reality in small businesses? Clearly, there is a need to eliminate or circumvent characteristics that hinder implementation. This is a necessary condition though not sufficient to ensure implementation. For example, access to favourable finance, affordable training (through government and counselling support), developing a leadership style that enables employees to participate in QM, and developing effective systems for fact-based decision making would be necessary. Clearly, as mentioned above satisfying the above criteria are not adequate; there is a need to reflect and capitalise on the advantages of small businesses have.

The above discussion lends to a classification of the EQM principles as sufficient and necessary conditions. For example, principles related to leadership, involvement of people, systems approach, and factual approach to decision making appear to fall into the 'necessary' conditions whilst customer-focussed organisation, continual improvement, and mutually beneficial supplier relationships appear to be 'sufficient' conditions.

The results presented above relate to small businesses but are they valid for extremely small businesses where the number of employees are fewer than ten? Indeed, this is an intriguing question that needs further examination.

STUDY OBJECTIVES AND METHODOLOGY

The objective of this study was to find out how quality should be managed in small and medium scale quantity surveying (QS) firms in New Zealand. In order to research this objective, it is necessary to investigate the following questions:

- How is 'quality' perceived by quantity surveying firms?
- What are the common quality problems, the reasons for these, and how such problems could be overcome?
- Can the EQM principles be used for managing Q?

Having considered different methodologies, the use of an interview survey was considered to be the best to research the above questions. QS firms were picked randomly (irrespective of the type of services offered by them) with a subjective judgement on what 'small to medium' means. Whilst there are no indications on the number of registered quantity surveying firms in New Zealand, if one were to make an estimate, 200 would not be an unrealistic number based on available information (Wilkinson, 1997). Thus a sample size of 15 (which exceeds 10%) was considered reasonably good enough for a survey of this nature.

When appointments for interviews were being obtained, it became clear that prospective interviewees were either delaying granting appointments or asking for postponement of previously scheduled appointments. A good number of respondents expressed their inability to give time for interviews when the interviewer arrived at their office on pre-arranged dates. Instead, some of them suggested that the interview guide be left with them to respond at a convenient time. Ultimately, it became quite clear that it might not be feasible to conduct sufficient interviews within a reasonable time frame. At this stage it was decided to modify the data collection technique to a questionnaire and a slightly modified version of the interview guide was delivered to all respondents for use as a self-administered questionnaire.

With some persuasion, out of the fifteen who consented to take part in this research, ten returned the questionnaire. Even though this is a comparatively smaller sample, it may be considered to be reasonably adequate because the sample is of a highly select category (being about 10%), questionnaire was lengthy, and the nature of the topic required insight in quality management.

The questionnaire was designed with a statement explaining the QM principles enumerated in 2.2. One may feel that the question wording was such that it may amount to a leading question. In retrospect, responses received reveal that the inclusions of the accompanying statements were productive in eliciting information (rather than creating a bias). It was observed that for this kind of descriptive frequency based analysis two information are vital: (a) the total number of responses on which frequencies (number or percent) are based; and (b) the number of missing cases. The latter category was omitted in the final analysis.

PERCEPTIONS, PROBLEMS, AND SOLUTIONS

Perceptions on Quality (Q)

The various definitions, the perceptions, and explanations related to quality can be classified into five broad categories viz. process based, user based, value based, organisation based, and standard based (Abeysekera, 2000). Classifying survey results into these categories provides a useful method for understanding the perceptions of quality of QS professionals. Examining results of this analysis (summarised in Table A.1) it is clear that responses fall into two categories only, namely, the 'process based' and 'user based' without any related to 'value based', 'organization based' and 'standard based' categories. (For examples, see Table A.1) Additionally, 'process based' perceptions seem to be more

common than 'user based' perceptions. Whilst there is no doubt that 'process based' perceptions are important and useful, so are 'user based' perceptions. The paucity of perceptions related to the latter indicates that there is an inadequate focus on customer-oriented concepts of quality, which is clearly very important in today's business environment. In fact, one may argue that it is the most important concept related to Q. Given this level of understanding, there is a need to broaden the knowledge of QS professionals and inculcate a quality culture into these organisations.

Quality Problems

According to Crosby "there is no such thing as a 'quality problem'"(1988, p. 58). If at all, what there could be is an engineering problem, a machine or a worker problem. Indeed, this is a very provocative statement! "What then is a quality problem?" Taking a different point of view to that of Crosby, one could describe a quality problem as one that originates from a lack of a clear perception of the categories mentioned above. Another view contributed by a respondent is that a quality problem is one which "occurs more than twice or generally on-going". This, indeed, is a very simple, a practical, and a demanding way to identify a quality problem. It embodies the ideas of 'doing things right the first time' and 'doing the right things' advocated in quality management. But it is important that such problems are kept track of so that a factual approach to decision making could be adopted (see EQM 7). The interviewees were also asked to give three examples of situations where they have had quality problems. The intention of this question was to find out the types of 'services' and types of 'activities' that often led to quality problems. The responses did not provide much information but for those listed below. This is not surprising, as there appears to be an inadequate understanding of issues related to Q as explained in 4.1 above.

- Errors in production of bills of quantities
- Shortcomings in estimating advice
- Shortcomings in contract documents
- Inadequate 'briefing' at project commencement
- Failure to carry out checks: (Arithmetic mistakes in word-processed documents and spreadsheets; accuracy of 'timesing' information; not entering location information and notes against dimensions.)

Reasons for Quality Problems

What are the reasons for the problems mentioned in 4.2? Almost half the respondents pointed out poor 'information/specification from others' (meaning architects, engineers, and clients) as one of the main reasons for having Q problems (see Table A.2). 'Unrealistic time estimates' was cited by about a third whilst 'poor training, skill and lack of experience' was cited by a fifth. It is interesting to note that none of the respondents perceived the lack of a 'quality assurance system' was a possible reason for the Q problems. Nevertheless, the use of such a system was seen more as a way of overcoming problems than as a reason for quality problems (see 4.4).

Overcoming Quality Problems

When questioned how quality problems mentioned above could be overcome, almost a third responded 'workplace training' (See Table A.3). Further examination of the results indicated that another fifth advocated better fees from clients, removal of competitive bidding practices as solutions. Perhaps, recommendations by the relevant professional bodies on typical fees for various types of services may help in this regard leaving competition to other issues connected with the service provided. Better time management, greater lengths of time to deliver services to clients, more supervision, adopting international standards, better resources (e.g. personnel, software and working environment) were some of the other suggestions made by the respondents. Perhaps, the most promising of these were the use of better resources, especially personnel (with good training), and computer software (in case they do not result in new technology related problems). At present, it appears that application of computer

software to quantity surveying is at a low ebb. As for the response on the use of standard systems that are internationally accepted, it is unlikely that these will find their way for reasons given below.

The 'How' of Managing Q and its Shortcomings

It appears from the above analysis that the 'three-step process' of identifying quality problems viz. finding the reasons for these problems, and then overcoming these problems by developing effective solutions appear to be a logical approach to pursue for managing Q. But the main drawback is that it lacks a quality focus.

Why is it necessary to manage a business with a focus on quality? Why is it necessary to have an organisational culture dedicated to quality? Most of the problems cited in 4.2 have an internal focus as against an external (or customer related) focus. Additionally, most are 'quality control' issues and do not appear to be controlled; they appear to occur over and over again (an ongoing basis). Some of the problems remain unsolved and are often seem to be taken for granted as the norm. Additionally, these problems result in delays, re-work, and additional costs both to the client and to the QS firms. These in turn cause more problems creating an intricate web of problems with no systematic approach to capture these problems, or still better, prevent such problems from happening in the first place. Given the lack of understanding of quality concepts, practices and the like (as evidenced by the discussions in sections 4.1 to 4.4), one way forward is to investigate the use of the EQM principles as a potential approach for managing Q. Given the availability of an international standard based on these very same principles (i. e. ISO9001(Int): 2000), why is it necessary to seek a different approach?

As mentioned in 2.4 there are major differences between small and large businesses that impact on managing Q. For one thing, the use of certified QM system is too costly. The low profit margins of small businesses do not make it feasible. Its implementation is complex and heavily resource laden. Additionally, it is time consuming too; as pointed out by Moore (1993) "time is hard to come by for small businesses, where one morning a week for the owner is a significant loss of man-hours". Moreover, QS firms in New Zealand do not see any value in using an ISO 9000 certified system (Wilkinson, 1997). In contrast, the use of the EQM approach to QM appears to be simple, transparent, cost effective, and does not appear to warrant the mobilisation of in-depth resources. Clearly, such features appeal to small businesses and it is therefore relevant to examine the use of the EQM.

THE RELEVANCE OF EQM TO QM

Customer Focussed Organisations

"Organisations depend on their customers and therefore should understand current and future customer needs, meet customer requirement and strive to exceed customer expectations" (ISO, 1998). Clearly, this is an issue at the heart of organisational priorities. How do organisations become customer-focussed? Of the responses received, learning to listen to the 'voice of the client'(VOC), maintaining a continuous dialogue with client, and responding to changing needs are noteworthy. In particular, the latter two responses appear to suggest how one may listen to the VOC. It is interesting to note that there is a degree of similarity between this approach and a comparatively new approach called 'concept engineering' developed by the Centre for Quality Management in the USA (Brodie and Seim, 1998). Clearly, many other approaches are available to small businesses depending on circumstances. For example, if the QS firm has a narrow customer base, then it may be possible to invite these customers to address the employees on how quality should be managed; why not transform the organisation to a 'customer driven' one?

Leadership for Quality

According to Moore (1993) 'leadership for quality' is foreign to most small business owners who understand nothing but being 'good' bosses and managers. If so, "how could one provide effective leadership to achieve quality?" This was the question that probed the captioned principle in this survey. The responses ranged from generic ones like, "be a motivator/good communicator", "make issues/ instructions clear", "lead by example" and "choose the right leader" to specific ones like "provide checks and means" (Table A.5). However, what is missing from these responses is the focus on quality and confirms Moore's views on leadership. This view is further reinforced by one of the comments made by a respondent: "As a small company leadership within the organisation is not an issue."

Is this really so? Does not leadership matter in small to medium scale firms? It certainly does. Reflect on the roles and responsibilities of leadership for quality: As explained earlier, the transformation of the organisation to a quality culture is fundamental (see 4.1). It is the leadership's responsibility that enables this transformation. 'This is considered to be a double-edged sword. On the one hand, it requires the leader to know why the transformation is necessary. He must be firmly committed to that necessity and must lead the organisation through that change. On the other hand the leader must transform him or her to the new style of leadership.' (Dept. of Defence, 1998, p. 22). In fact, the responsibility for all the principles discussed herein falls surely on leadership.

Involvement of People to Achieve Quality

"People at all levels are the essence of an organisation and their full involvement enables their abilities to be used for the organisation's benefit."(ISO, 1997). Many a writer has echoed these sentiments over and over again: "I used to say that people are assets, not commodities. But they are not just assets: They are jewels" is a well-known comment made by Deming. Amongst others who have expressed similar views are Inkson and Kolb who state that 'anyone, anywhere in the organisation can ultimately affect quality or service standards through their own efforts' (1998, p. 104). Additionally, these views are consistent with the findings that lack of employee participation and contribution has been identified as a barrier to implementation of quality systems because "participation and contribution is necessary to gain employee commitment and support" (Reid, 2000, p.12). But the burning question is how could organisations ensure employees' commitment and support to achieve quality.

In response to this question, one third of the respondents mentioned that organisations must allow people to become involved (i.e. "obtaining their buy-in") and make them feel part of the team. Another third responded that it is essential to give credit to employees when due, to praise and reward as well in order to obtain their full involvement. About a quarter of the respondents pointed out that besides making provisions for their participation, it is necessary to challenge them too (see Table A.6). What transpires from these responses is a two-pronged approach for effective involvement of people: (a) organisations should facilitate employees to become involved, and (b) deserving employees should be credited and rewarded.

But, what does not seem to emerge is a clear focus on quality: Consider the first approach mentioned above. How could organisations facilitate employees to become fully involved with respect to quality? Whilst it may be possible to establish number of possible strategies (see Deming's forces of destruction), training on quality concepts and techniques is fundamental, and such training must be affordable to small organisations (see 2.3). As for the second approach suggested above, i.e. on rewards, one needs to question how employees should be rewarded from a Q perspective? For example, Idrus points out that there is a need to "catch people doing things right [the first time] and praise them" (Inkson and Kolb, pp. 482-3). Clearly, the types of rewards that can be used in small and medium scale organisations are well documented but what is important to remember is that such rewards need to have a focus on quality. For example, according to Deming, rewards that promote competition to the detriment of the other lacks a quality focus.

Quality as a Process

What is a process? "Any activity that receives inputs and converts them to outputs" is a process (ISO9000: 2000). The underlying rationale for viewing quality as a process is that "a desired result (say quality) is achieved more efficiently when related resources and activities are managed as a process". The respondents were then asked as to what steps they would put in place to ensure their processes produce quality. To state differently, what have they learnt from listening to the 'voice of the process'? (Dept. of Defence, 1998, p. 35)

All respondents answered this question and a host of practices were mentioned (see Table A.7). However, it appears that when it comes to managing resources and activities as a process to achieve quality, only a few respondents had a definite procedure in place to produce quality. One respondent stated the use of process flow- charts for ensuring quality. Another stated the use of standardised formats. Yet another stated the use of a quality assurance (QA) manual (which is desirable if not too bulky). Few others mentioned the use of computer software to avoid manual calculation errors. On a close examination of these responses, it appears that the majority of the respondents stated control procedures reliant on skill ("monitor and feedback staff weak spots"/ "staff training"), technology (software), or reactive measures ("bulk check/double check calculation") to ensure quality.

A systematic approach is needed against these ad-hoc practices: There is a need to identify and document all the processes first prioritising as principal and secondary processes, and then introducing procedures to plan and control quality starting with the principal processes. The common argument that such approaches involve much documentation (which is time consuming) is minimised by the 'prioritising approach'. In other words, it is an approach of selecting the vital few as against the trivial many - an approach favoured by Juran when prioritising quality problems (Suarez, 1992, p.9).

Systems Approach to Quality

The systems approach to quality incorporates the idea that processes that produce quality need to be approached in its totality; in other words, the approach should not be fragmented but integrated. Indeed, processes are inter-related; often the output from a preceding process forms an input to the next process. Therefore, there is a need to systematically identify all the processes, understand the interactions between such processes, and manage these to achieve quality. The underlying rationale for taking a systems approach to quality is that managing a system of interrelated processes for a given objective (which may be quality) improves an organisation's effectiveness and efficiency. The actual question then posed was: 'Explain how this may be achieved?'

The responses summarised in Table A.8 indicate clearly the respondents' lack of clear grasp of the issue. In the light of this, it may now be concluded that most respondent QS firms do not have a clear understanding of or familiarity with the issue. Again, this may be the reason why the respondents found the question demanding, and why most of them either interpreted it wrong or did not respond at all.

It was Deming who introduced the idea of a 'systems approach to quality'. According to him a system must have an aim for it to be managed effectively. The aim must be clear to all employees and in doing so quality comes before (short-term) profit. To work collectively towards this common aim, it is necessary to have a team approach. It is wrong for one person (or a unit) to excel to the point where it adversely affects the contribution of others. This notion is somewhat similar to the 'tall poppy syndrome' known to New Zealanders. Additionally, according to Deming, the systems view focuses on pleasing the customer and quality is the result of interactions of everybody. When a 'fault' occurs, the cause is sought in the system (and not in the people). These views are useful to small and medium scale organisations as the absence of these foretell ineffective leadership for quality and an inability to involve people for producing quality.

Achieving Continual Improvement

Perhaps, out of the eight principle discussed earlier, this is one of the simplest to understand - a principle that most people have had to come to grips with since childhood. It requires that 'continual improvement should be a permanent objective of an organisation' and the survey sought to identify examples of how this is being done. All respondents answered this question. Some of the main responses included suggestions like sending employees on training courses and seminars, upgrading resources, computer automation, client surveys, post-project reviews, and monthly performance measurement processes (Table A.9). It is clear from these responses that most of the respondents have come up with, piece meal, as and when they occur, non-routine and conventional approaches to continual improvement. Clearly there are many techniques (Bicheno, 1994) that may have potential applications in small QS practices. However, further studies are necessary to investigate how such techniques may be used successfully.

Analysis of Data and Info for Achieving Quality

'Effective decisions are based on the analysis of data and information.' The respondents were asked to explain the relevance of this statement to quality management. In other words, this question relates to how analyses of data and information may be used to make effective decisions leading to achievement of quality.

Any formal quality management system should collect and analyse appropriate data to provide information on (a) customer satisfaction and dissatisfaction; (b) conformance to customer requirements; (c) characteristics of processes, product and their trends; and (d) suppliers (AS/NZS ISO 9001(Int): 2000, p19). The data in Table A.10 show that none of the respondents have anything similar in place. In fact, one respondent confirmed that it had "no formal analysis process in place". Yet another stated that there is "no direct relevance" of this principle. Others gave typical 'text book' answers which were not specific about the actual practices adopted in their companies. Can small and medium scale organisation collect data? Do they have resources to do so? It appears that neither this study nor any other has clearly demonstrated applications of particular relevance to quantity surveying firms suggesting that there is a need for further research.

Mutually Beneficial Supplier Relationships

An organisation and its suppliers are interdependent, and a mutually beneficial relationship enhances the ability of both to create value." (ISO, 1997) According to the responses received even small quantity surveying firms sub-contract work out. For example, one firm stated that they subcontract the preparation of bills of quantities. Most agreed with this principle although some commented that it had no relevance to them. Does this mean that these firms do not subcontract work or do not rely on suppliers? Once again the lack of clear examples from the quantity surveying profession to highlight real advantages of 'partnering' type approaches hinder progress. Clearly, there is need for further research.

An Overview

It is clear from the above analysis that the respondents had no real difficulties in comprehending these principles except for the 'systems approach to management' principle. Additionally, these principles were seen to be relevant except for the 'fact based decision making' and 'mutually beneficial supplier relationships' principles. The main strategies identified by the respondents are summarised in Table 2 along with some other strategies. As pointed out before there are areas that need to be researched further especially with respect to the application of various tools and techniques to broaden the understanding of the 'what' of QM. The simplicity of these principles makes it suitable for application in small QS practices or for that matter in any small business. This simplicity makes it easier and faster to communicate. Additionally, as there isn't a need for substantial training (unlike many other

approaches) it appears to be affordable too. However, what these principles do not show is how they could be implemented in practice.

Table 2: The 'how' of EQM

Principle	Survey strategies	Other strategies
Customer-Focused Organisation	Listen to the voice of the client: Maintain a continuous dialogue; respond rapidly to changing needs of client.	Identify gaps between the 'voice of client' and 'voice of the service' provided.
Leadership for quality	Use generic strategies related to successful leadership. Make available means to produce Q.	Transfer organisation to a quality culture; Take responsibility for all other quality principles.
Involvement of People	Facilitate employees to become fully involved. Credit and reward employees.	Training in Q. Remove barriers for involvement (see Deming's forces of destruction). Rewards need a Q focus.
Process Approach	Use of skill and technology related approaches.	Adopt a systematic approach: List all processes. Prioritise. Select vital few for planning and control.
System Approach to Management	-	Ensure 'aims' of organisation are communicated to employees. Works of Deming is particularly useful.
Continual Improvement	Training, upgrading resources, computer automation, client surveys, post-project reviews, performance measurement.	Apply techniques/tools for quality improvement.
Factual approach to decision making	-	Investigate how relevant data can be captured with approaches suitable for small businesses.
Mutually beneficial supplier relationships	-	Need to establish case studies etc. to demonstrate applications.

CONCLUSIONS

A Conceptual Model for Managing Quality

This study embarked on finding how Q should be managed in small and medium scale QS firms. The discussions in sections 4 and 5 clearly show that the 'three step process' for identifying Q problems, finding reasons for these problems, and then finding how to overcome these problems is a logical approach to managing quality. However, it lacks a focus on quality. But, investigations with respect to the EQM principles clearly show that if the above process is to have a Q focus, then there is a need to understand the 'what' of quality management. In other words, this understanding must 'drive' the 'three step process' for it to produce 'results'. However, the results would be meaningless if it operates in a wrong 'environment'. In other words, there is a need to focus on the characteristics of small businesses to form the 'environment' in which this process operates.

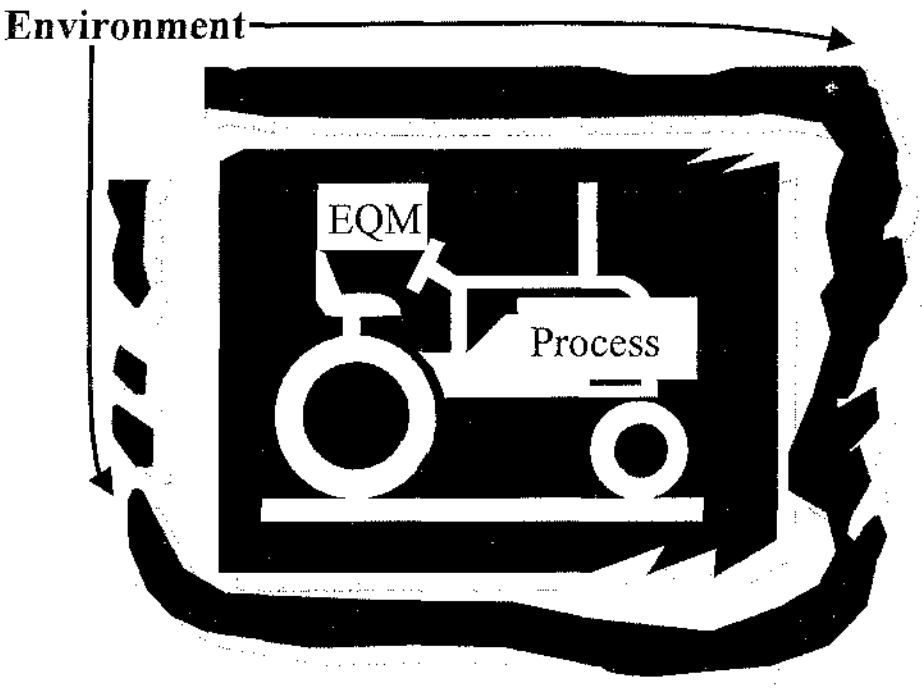

Fig. 1: Conceptual Model for QM

Model Implementation

The model proposed above provides answers to the 'what' and 'how' of QM but falls short of providing guidance on how this model could be implemented. The responsibility for implementing this model (i. e. the 'who' of QM) falls on all employees with varying degrees of responsibility. The simplicity of the model makes it easier to explain with the consequence need for less training thus making it affordable to implement. For example, out of the eight QM principles, there was only one principle that was difficult to comprehend (i.e. the systems approach to quality). However, there is need to deal with two other principles which were viewed to be irrelevant (i.e. the principles related to fact based decision making and mutually beneficial supplier relationships). The implementation process can start no sooner the organisation decides to take this approach to Q (without any in-depth training) as it is easier to understand. Additionally, with the comparatively small numbers of employees, communicating the approach is relatively easier. However, there is a need to convert the organisation to a quality culture in the process of doing so but both may be achieved simultaneously. What was mentioned above are the macro aspects of the model implementation. The micro aspects or the specifics of implementation, must be found through a complementary approach of the 'what' and 'how' aspects of QM explained earlier. For example, the first of the EQM principles relates to 'customer focussed organisations' which requires the QS professionals to listen to the 'voice of the customer' for the purpose of identifying 'quality problems'. In other words, the EQM principles complement the 'process steps' (see Fig. 2). As explained before the responsibility for implementation falls on leadership. The implementation process does not stop here. This complementary approach has to be stretched further. For example, there is a need to establish what techniques and tools could be used by small businesses to 'tune' to the 'voice of the customer' etc. Clearly there are areas for future research.

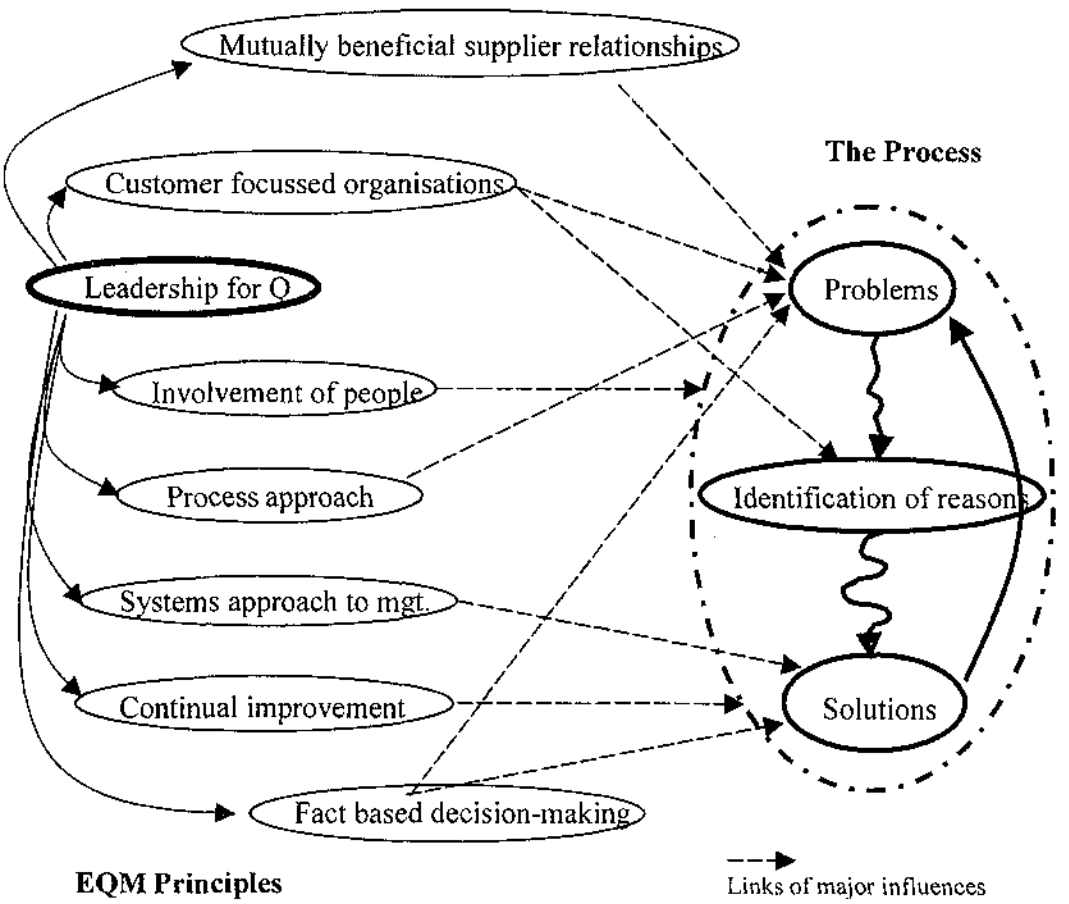

Fig. 2: The Complementary Approach

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Appendix 1: Summarised Survey Results

Abbreviations: NR - Number of Respondents PR - Percentage of respondents

Table A.1: Perceptions of Quality

Category	Perceptions
Process based	▪ Doing things right first time ▪ Highest standards in all that we do ▪ Best industry standard, first-class, perfect accurate results with integrity ▪ Providing professional services of the highest standard ▪ Providing all advice on time ▪ Producing consistently reliable and accurate information ▪ Accuracy: in descriptions i.e. explain precisely qualities - accurate, exact Price – accurate and or the current market • The use of methods to ensure completeness and accuracy in the production of estimates, bills of quantities, progress valuations and final accounts. The use of standardised formats in all documentation. All letters and documentation reviewed by a principal.
User based	▪ Quality of service, time, accuracy and presentation ▪ High standard of service, high customer satisfaction

Clarifications (and not responses): Examples of 'value based', 'organisation based' and 'standard based' perceptions: (a) **Value based:** Quality is degree of excellence at an acceptable price and the control of variability at an acceptable cost (b) **Organization based:** Quality is a way of managing a business (c) **Standard based:** Totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs; The totality of characteristics of an entity (activity or process, a product, an organization, a system, or a person, or any combination thereof) that bear on its ability to satisfy stated or implied needs

Table A.2: Main reasons of quality problem

Reason for Quality Problems	NR	PR (%)
Poor info/specs from others	5	50.0
Unrealistic time allowed	3	30.0
Poor training/experience/skill	2	20.0
Lack of checking/preventive action	2	20.0
Lack of thought/concentration	1	10.0
Software limitations	1	10.0
Teething problem in new systems	1	10.0

Note: Total number of respondents =10

Table A.3: Overcoming quality problems

How to overcome quality problems?	NR	PR (%)
Better time management	1	10.0
Professional body training/workplace training	3	30.0
Allowing more time by clients	1	10.0
Better fees by clients/remove bidding	2	20.0
Utilise quality systems (checks/peer reviews)	1	10.0
More supervision	1	10.0
Adopting international standards/curriculum	1	10.0
Appropriate resources (personnel, software, work environment)	1	10.0
Determine client requirements	1	10.0

Note: Some respondents cited more than one ways. Total no. of respondents 10.

Table A.4: Meeting customer requirements

Ways for meeting customer requirements	NR	PR (%)
Continued dialogue with client	2	20.0
Listen to/feedback from customers	3	30.0
Exceed expectations	1	10.0
Respond to changing needs	2	20.0
Responding with enhanced service	1	10.0
Being accurate and specific	1	10.0
By updating/reading/being innovative	1	10.0
Understanding customer needs	1	10.0

Note: Total no. of respondents=10. Most respondents offered more than one answers

Table A.5: Providing effective leadership

How to provide effective leadership?	NR	PR(%)
Choose the right leader	1	11.1
Be a motivator/good communicator	2	22.2
Provide checks/means	2	22.2
Make issues/instructions clear/answer queries	2	22.2
Lead by example	1	11.1
Small organization, leadership is not an issue…	1	11.1

Note: Total number of respondents=7. Two respondents did not answer this question and another two responses were not relevant. Some respondents offered more than one answer

Table A.6: Involving of People to Achieve Quality

How to Involve People	NR	PR (%)
Keeping people informed	1	12.5
Reward /recognition for success	3	37.5
Delegate responsibility	1	12.5
Challenge them	2	25.0
Allow involvement/participation	2	25.0
Exhortation/encouragement	1	12.5

Note: No. of respondents=8; two respondents did not provide an answer to this question.

Table A.7: Process steps for producing quality

Process Steps in Place for Producing Quality:	NR	PR (%)
Staff use flow charts as a guide	1	10.0
Use QA Manual	1	10.0
Monitor and feedback staff weak spot	2	20.0
Continual supervision of staff	2	20.0
Use existing specs/price database	1	10.0
Use standardized formats	1	10.0
Use software to avoid manual errors	1	10.0
Plan-time, staff, product	1	10.0
Bulk quantities check/double check calculations	1	10.0
Staff training	1	10.0
Customer-focused, leadership and involving people	1	10.0

Note: Most respondents offered more than one answer. Total no. of respondents=10

Table A.8: Systems Approach to Management

System Approach to Management	NR	PR (%)
Experienced management, set procedures & QC review process	1	16.6
Continual training and improving/updating QA manuals	3	50.0
Analytical approach to management	1	16.6
Study the processes and devise better ones	1	16.6

Note: Total no. of respondents=6. Three respondents did not answer and one answer was not usable.

Table A3.9: Achieving Continual Improvement

Achieving Continual Improvement	NR	PR (%)
CPD through NZIQS/seminar or similar	3	30.0
Newspaper/industry journals/exhibitions	1	10.0
Receptive to new methods	1	10.0
Always produce your best	1	10.0
Checking with clients before, during, after a project, client surveys	1	10.0
Inter office skill-sharing	1	10.0
Upgrade resources/tools/software/systems	2	20.0
Make changes/eliminate problem-causing	1	10.0
Management review/integrate standards-procedures	1	10.0
Industry discussion	1	10.0
Computerization/automation/efficiency improvement	2	20.0

Total no. of respondents=10 Most respondents cited more than one ways

Table A.10: Analysis of Data and Info for Achieving Quality

Analysis of Data and Info for Achieving Quality	NR	PR (%)
No formal analysis process in place	1	11.11
Benchmarking against best practice	1	11.11
Facts are essential for good decision	1	11.11
Use of up to date data and information for quality	1	11.11
Best analysis and info give best quality results	1	11.11
Info database from earlier projects used for pricing new project	2	22.22
No direct relevance	1	11.11
Data must be effectively used	1	11.11

Note: Total no. of respondents=9 One respondent's answer was not relevant, therefore unusable.

STATUTORY CONTROL AND APPROVAL ON CONSTRUCTION IN MALAYSIA: CONSTRAINTS AND STRATEGIES

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ABSTRACT

The paper describes the statutory control and approval on construction in Malaysia and reports the findings of a study on constraints in obtaining statutory approvals and the strategies that could be implemented to remove or alleviate the constraints identified. The paper offers lessons for other countries that are broadly at the same level of development as Malaysia on issues surrounding statutory control and approval on construction.

Keywords: Construction, Constraints, Malaysia, Procurement, Statutory, Strategies.

INTRODUCTION

Among the objectives of statutory control on construction in Malaysia is to ensure systematic and orderly development. However, many commentators argued that the process of obtaining statutory approval is complex and relatively slow. It involves various authorities - public and private - and at varying levels. In addition, different sets of statutory control and approval are applicable at different stages of the procurement process.

The objective of this paper is to describe the statutory control and approval on construction in Malaysia; and to report the findings of an empirical study relating to the processes of construction procurement in Malaysia, the constraints identified in obtaining statutory approvals and the strategies that could be implemented to remove or alleviate the constraints identified.

STATUTORY CONTROL AND APPROVAL ON CONSTRUCTION IN MALAYSIA

The objectives of statutory control and approval on construction in Malaysia include:
1. To achieve proper use of land;
2. The appropriate planning of towns and cities; and
3. The regulating of standards of buildings including fire prevention and provision of services, the standards of roads, drains and lighting.

The laws, by-laws and regulations relating to statutory control and standards on construction in Malaysia may be divided into two broad categories: (1) statutes that directly effect construction, and (2) statutes that have indirect effect on construction.

The first category of laws, by-laws and regulations impose strict control on construction activities including the processing and approving of plans from change of land use, sub-division and amalgamation, Development Order, Building and Services Plans approval to issuance of Certificate of Fitness for Occupation and therefore they have direct effect on construction activities.

The second category of laws, by-laws and regulations has indirect effect on construction activities because they govern and control the administration of the authorities and the practising professionals in architecture, engineering, surveying and the activities of property developers.

The current laws, by-laws and regulations relating to statutory controls and standards that has direct effect on construction activities include:
- Town and Country Planning Act No. 172, 1976;
- Federal Territory (Planning) Act No. 267, 1982;
- National Land Code, Act No. 56, 1965;
- Environmental Quality Act 1974; and
- Uniform Building by-laws and Street, Drainage & Building Act No. 133, 1974.

The current laws, by-laws and regulations relating to statutory controls and standards that has indirect effect on construction activities include:
- Local Government Act No. 171, 1976;
- Architects Act 1967 (Revised 1973);
- Registration of Engineers Act (Revised 1974);
- Registration of Quantity Surveyors Act 1967 (Revised 1989);
- Licensed Land Surveyors Ordinance 1958; and
- Housing Developers (Control and Licensing) Act 1982.

In addition, various amendments, by-laws and regulations are in force to operationalise the above Acts. The authorities including the private bodies use the above law, by-laws and regulations in exercising control on and granting approval for construction activities.

In spite of the laws, by-laws and regulations being national in its jurisdiction, their enforcement by the local authorities have been done only partially (Alwi, 1995). In addition, there appear to be inconsistencies in the application of the laws, by-laws and regulations between public and private construction activities. For instance, public buildings are normally exempted from the existing statutes and are therefore not strictly subject to the statutory control, but designers of public works usually include the prevailing statutes into considerations.

The Process of Obtaining Statutory Approvals

Statutory control on construction and the process of obtaining statutory approval involve various authorities: public and private. The former comprises of three levels of governments - local, state and federal. In addition, different sets of statutory control and approval are applicable at different stages of the procurement process.

It is observed that procedures for obtaining statutory approval for construction are not standardised. They vary from one project to another depending on its nature, size and complexities; from one department to another within a local authority; and from one local authority to another within Malaysia.

In an attempt to simplify the discussion of statutory control and approval in Malaysia, procedures for statutory control and approval on building projects practised by the Kuala Lumpur City Hall has been selected for discussion and illustration. It is contended that the Kuala Lumpur City Hall's system of processing and approving plans are quite representative of those existing in other local authorities.

Statutory control and approval for construction may be divided into four key stages:
1. Development Order;
2. Building and Services Plans;
3. Construction; and
4. Certificate of Fitness for Occupation.

Chart 1 shows a flow chart of a typical process of obtaining statutory approval for a building project in the City of Kuala Lumpur.

The function of submitting applications for statutory approval to the relevant authorities is the responsibility of the town planner or architect or registered building draughtsman or engineer for full compliance of the respective laws, by-laws and regulations.

CHART 1- Statutory Approval Process: Kuala Lumpur City Hall

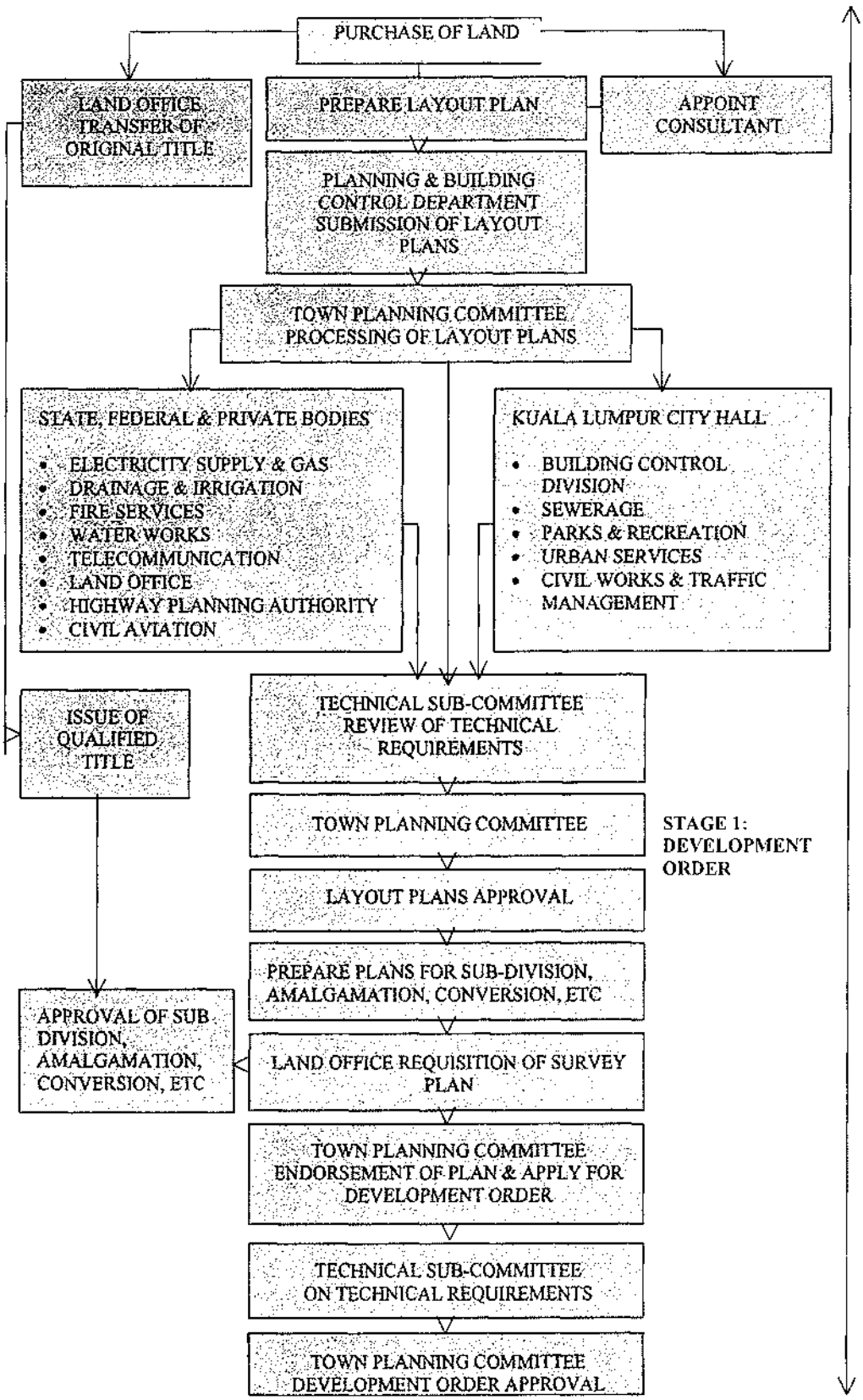
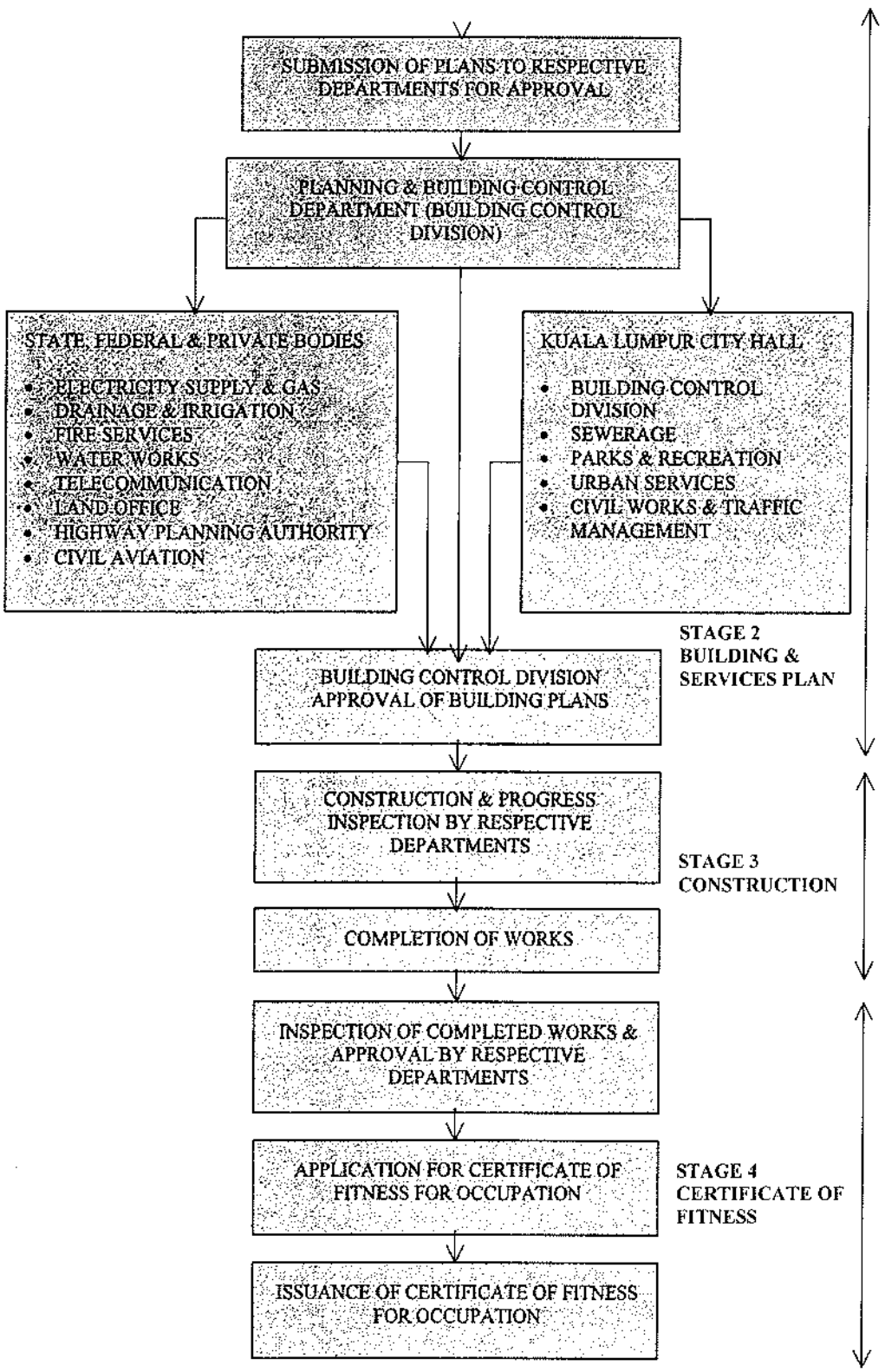


CHART 1- Statutory Approval Process: Kuala Lumpur City Hall (Cont'd)



Development Order

Briefly, the development order is the first stage in a series of activities for statutory approval for construction. Broadly, it involves four key activities, i.e., (1) approval pertaining to land matters, (2) approval for Environmental Impact Assessment (EIA), (3) planning permission, and (4) application for Development Order Approval.

Building and Services Plans

The application for approval of the building and services plans involves the client or his/her agent submitting detailed architectural, engineering and specialist designs to the Kuala Lumpur City Hall's Planning and Building Control Department. Detailed designs must also be submitted to other governments' departments, statutory and private bodies responsible for different utilities and services for their approval.

Upon approval of the building and services plans, clients may commence work on site. However, actual work could only starts after a notice of intention to commence work on site is approved by the Kuala Lumpur City Hall.

Construction

During construction, the contractor is responsible for observing the various laws, by-laws and regulations concerning construction activities such as Local Government, Health and Safety, Factories and Machinery, etc. The objective of these statutes is to ensure that construction works are monitored and disciplined.

There would be site inspections by different authorities to ensure that construction sites are safe, clean and free from pollution, fire, health and safety hazards to workmen, property and the neighbouring areas.

Certificate of Fitness

It is mandatory that a Certificate of Fitness or CF be obtained before a completed facility can be occupied and used. In applying for CF to the Kuala Lumpur City Hall's Building Control Division the client or his/her agent must submit among others final and complete as-built drawings for the building works and services and giving notice for final inspection on the completed project. The Building Control Division and the various authorities will scrutinise the as-built drawings and will inspect thoroughly the completed project to ensure that it complies with all relevant Laws, by-laws and Regulations and the conditions stipulated in the Development Order Approval and/or Building and Services Plan approvals.

Effects of Statutory Control on Construction

It is contended that there are two contrasting effects of statutory control on construction in Malaysia. On the one hand, it facilitates achieving proper use of land, appropriate planning of towns and cities, regulating of standards of buildings, etc. so that planning and construction of building can be carried out in a systematic and orderly manner.

On the other hand, statutory control on construction has imposed institutional rigidity and produced complex procedural formality and bureaucracies, the results of which may include delay, difficulties and hardship on the processes of construction procurement. Consequently, the whole process of obtaining statutory approval may take a considerable period of time. For instance, Wang (1987, p94) reported that for a sizeable housing project the overall time taken may well be from 5 to 8 years.

Some of the adverse effects of statutory control on construction are (Wang, 1987):
- Delay in planning and implementing construction projects;
- Bureaucracies lead to a great deal of time and manpower;
- Uncertainty in programming projects;
- Increase in holding charges;
- Increase in financing charges;
- Creating cash-flow problems;
- Dislocating demand and supply of properties and housing needs of society; and
- Causing properties to increase in prices.

STUDY ON CONSTRAINTS AND STRATEGIES IN OBTAINING STATUTORY APPROVAL ON CONSTRUCTION IN MALAYSIA

Between 1996 and 1998 the author was in the UK on sabbatical leave studying for his PhD. The study focuses on the identification of any constraints in the processes of construction procurement in Malaysia that may inhibit the level of construction output and on the development of strategies to remove or to alleviate the constraints identified. The study represents the first major attempt to study empirically the processes of construction procurement in Malaysia.

This part of the paper reports on the aspect of the study relating to obtaining statutory approval in construction. Other aspects of the study were reported elsewhere (see Abdul Rashid, 1998; Abdul Rashid and Morledge, 1998a; Abdul Rashid and Morledge, 1998b; Abdul Rashid and Morledge, 1999).

Abdul Rashid (1998) defined statutory approval as "obtaining permissions from the relevant authorities to initiate and to construct a facility and upon its completion to occupy and use the completed facility."

In the study constraints is defined as limitations or restrictions imposed on the processes of acquiring construction projects.

Literature Review

The literature review uncovers various articles and media reports alleging constraints in obtaining statutory approval on construction in Malaysia. A summary of the constraints is:
- Constraints during the initial stages of the processes of construction including obtaining approvals relating to land matters, Environmental Impact Assessment reports, planning permission, Development Orders and Building and Services Plan approvals;
- Constraints during the construction stage including allegations of the authorities' high-handed approach in enforcing statutory regulations and indiscriminate issuance of work-stop orders; and
- Constraints in obtaining Certificate of Fitness for occupation of the completed facility including clients facing various procedural and bureaucratic problems, ambiguous procedures, staff shortages within the authorities and that the process takes a very long time.

On the basis of the constraints presented, it is considered to be instructive to identify the types and extent of constraints in obtaining statutory approval in terms of limitations or restrictions imposed on the processes of acquiring construction projects.

Methodology

The study adopts the triangulation method. It involves: (1) an extensive literature review, two questionnaire surveys, i.e. Survey 1 and Survey 2, and semi-structured face to face or telephone interviews; and (2) multiple data sources from literature, primary data from respondent organisations

and professional institutions. The research processes therefore, are robust and enabled to achieve high quality data and findings.

There were three stages to the study:

Stage 1 involved the administration of Survey 1. The objective of Survey 1 was to identify the types and extent of constraints in obtaining statutory approval in Malaysia that may inhibit the level of construction output. Survey 1 was carried out by post between November 1996 and January 1997.

The database for Survey 1 comprised the names and addresses of 1,852 main Malaysian organisations - clients, designers and contractors - currently involved in construction procurement in Malaysia, all of which formed the questionnaire sample.

In this study, a subjective assessment approach was used to record the expert opinions of respondent organisations. Respondents were asked to rate, on a Likert style scale the extent of constraint in obtaining statutory approval either 1, 2, 3 or 4 representing No, Low, Medium or High respectively. A rating of 4 (High) indicates high constraints thus implying that the process of construction procurement could be severely restricted or limited. While a rating of 1 (No) indicates no constraints thus implying that the process of construction procurement could be performed very efficiently.

Considering that it would be highly unlikely that no constraint in obtaining statutory approval was experienced, the scale of 1 (No) was treated as a dummy scale. In the analysis of data the scores for 1 (No) were combined together with the scores for 2 (Low) to represent Low constraints. The scoring system is set as 1, 2 and 3 for Low, Medium and High ratings respectively.

In the analysis of data, the equation used by Arditi and Mochtar (1996) was adopted:

$$S = \frac{3H+2M+L}{H+M+L}$$

Where S is the weighted mean score, H is the percentage of respondent that gave a high rating; M is the percentage of respondent that gave a Medium rating; and L is the percentage of respondent that gave a Low rating. The interpretation of the weighted mean score is as follows: mean score between 1 and 1.66 are classified as low (L), 1.67-2.33 as medium (M) and 2.34-3.00 as high (H). Activities in obtaining statutory approval that received high or medium scores are considered to be constrained.

Stage 2 involved the administration of Survey 2. The primary objective of Survey 2 was to appraise proposed strategies designed to remove or to alleviate the constraints in obtaining statutory approval in Malaysia identified through Survey 1. Survey 2 was carried out by post between April and June 1997.

The database for Survey 2 was compiled from those respondent organisations in Survey 1 who indicated willingness to participate in Survey 2. In all, a list of 186 organisations was compiled.

Stage 3 involved reviewing the proposed strategies in the light of the analyses and comments of the respondent organisations in Survey 2 and the carrying out of semi-structured interviews by the author in Malaysia. The objective of the interviews was to validate the proposed strategies and to solicit additional information including information to validate the constraints identified.

Respondent organisations for the interviews were compiled from: (1) the respondent organisations in Survey 2 that indicated willingness to participate in the interview (24 organisations), and (2) a stratified random sampling from the database used in Survey 1 after excluding the organisations that indicated willingness to participate in the interview (40 organisations).

In addition, the database for the interviews includes seven professional organisations: six professional institutions, i.e., one representing the clients, three representing the designers and two representing the

contractors; and the Malaysian Construction Industry Development Board (MCIDB). This aspect of the interview forms the third part and the vital process of the triangulation research method adopted by the study. In all, the interview database comprises names and addresses of 71 organisations. The interviews, mostly face to face but some through telephones were performed between August and September 1997.

Results

In all, 205 organisations (11%) returned completed questionnaires for Survey 1. From the results, 170 organisations (83%) indicate experiencing constraints within the processes of construction procurement. In relation to constraints in obtaining statutory approval, activities that are suffering constraint are given in Table 1.

Table 1: Constraints Identified

	Types of Constraints	Mean score	Extent of constraint
1	Constraints at project planning stage caused by procedures in obtaining statutory approval	2.07	Medium
2	Constraints in contract administration due to political and/or bureaucratic interference	1.80	Medium
3	Constraints caused by procedures in obtaining Certificate of Fitness	1.77	Medium
4	Availability of reliable source of information (on statutory requirements, cost data, project opportunities)	1.72	Medium

Chi-square Test of Independence was performed on each constrained activity in relations to the types of organisations - clients, designers and contractors. The value of p was set at <0.05. The results show that there were no significant relationship between the constrained activities and the types of organisations. This suggests that there is a general consensus amongst the clients, designers and contractors on the type and extent of constraints.

Appraisal of Proposed Strategies

In all, 54 organisations (29%) returned completed questionnaires for Survey 2. The results on the two most frequently agreed strategies that could be applied to remove or to alleviate the constraints identified in obtaining statutory approval are as shown in Table 2.

Chi-square Test of Independence was performed on each strategy in relation to the categories of organisations - clients, designers and contractors. The value of p was set at <0.05. The results show no significant relationship between the appraised strategies and the categories of organisations. However, the chi-square test results also indicate that there were several strategies that did not receive full consensus. This suggests the need for carrying out the validation interviews.

Validation of Constraints and Strategies

In all, 47 interviews (66%) were performed. From the forty-seven interviews, four interviews were with the professional institutions and one interview with the MCIDB.

The results on the interviews with the representatives of the clients, designers and contractors organisations show a high level of agreement with the strategies. In addition, they also indicated agreement to the relative ranking of the strategies.

The results of the interviews with the representatives of the professional institutions and the MCIDB show a high level of agreement with the constraints identified and the strategies.

CONCLUSIONS

The findings of the study confirmed allegations that constraints in obtaining statutory approval are being experienced in Malaysia. In addition, the findings indicate the activities that are constrained and the strategies that could be implemented to remove or to alleviate the constraints identified.

Furthermore, the findings of the study indicate that government intervention is required in implementing the strategies.

The findings of the study could assist the authorities responsible for the development of the construction industry in Malaysia. In addition, the findings offer lessons for other countries that are broadly at the same level of development as Malaysia on issues surrounding statutory control and approval on construction. (Malaysia is a middle-income economy on the basis of the country classification by GNP per capita by the World Bank in 1997).

The methodology used in this study may be repeated in conducting similar studies in Malaysia in the future or in construction industries elsewhere.

Table 2: Strategies to Remove or Alleviate the Constraints Identified

	Constraint and Strategy	p (%)	r
1	Constraints at project planning stage caused by procedures in obtaining statutory approval		
	Streamline and standardise administrative procedures in Local Authorities	88.89	1
	Simplify and standardise procedures nationwide	85.18	2
2	Constraints in contract administration due to political and/or bureaucratic interference		
	Superintending Officer should be fully qualified and experienced professional	98.08	1
	Improve organisational and functional coordination between clients and other bodies to avoid administrative bottlenecks	92.31	2
3	Constraints caused by procedures in obtaining Certificate of Fitness		
	Streamline and standardise administrative procedures in Local Authorities	92.31	2
	Disseminate information on approval procedures	94.00	1
4	Availability of reliable source of information (on statutory requirements, cost data, project opportunities)		
	Encourage local universities to conduct relevant research and development and in publishing the findings	96.15*	1
	Encourage professional institutions to conduct relevant research and development and in publishing the findings	96.15*	2

p Percentage of respondent organisations indicating agree and strongly agree with the proposed strategy

r Relative ranking in accordance with the percentage of respondent organisation indicating agree and strongly agree with the strategy

* Equal percentages, ranked in accordance with the number of organisations indicating strongly agree with the strategy.

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REGISTRATION OF QUANTITY SURVEYORS THE MALAYSIAN EXPERIENCE

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ABSTRACT

The objective of this paper is to share with the audience the philosophy and practice of Quantity Surveyors' Registration in Malaysia. Registration of Quantity Surveyors in Malaysia is governed by the Quantity Surveyors Act 1967. Over the past 33 years, 1314 Quantity Surveyors were registered and 257 permit to practise were issued to Firms and Body Corporate. The purpose of this registration together with the procedures adopted will be discussed in this paper. Relevant clauses in the Act and the Rules will be highlighted. Problems associated with this registration procedure in the light of recent development in the education policy will also be presented.

Keywords: Maintain professional standard of Quantity Surveyors

INTRODUCTION

Registration of Quantity Surveyors was first enacted by an Act of Parliament in 1967 via Registration of Surveyors Act. The Act defines amongst others the scope of services of Quantity Surveyors, registration of Quantity Surveyors and punitive actions to be imposed on non-compliance of the Act. The Act was first amended in 1981 and later changed to Registration of Quantity Surveyors Act 1989 with amendments in 1992 and 1995. Currently the Act is in the process of further amendments amongst others to give the Board more flexibility and powers in respect of disciplinary action, imposition of penalties and enforcement of the Act.

THE BOARD OF QUANTITY SURVEYORS MALAYSIA

Function

Under the Act, the Board of Quantity Surveyors Malaysia was established to perform the following functions:1

a) to keep & maintain a register of Quantity Surveyors.
b) to approve or reject applications for registration.
c) to order cancellation, removal or reinstatement.
d) to fix from time to time with the approval of the Minister of Works, the scale of fees for professional services.
e) to hear and determine disputes relating to professional conduct or ethics of Quantity Surveyors or to appoint a committee or arbitrator to hear and determine disputes.
f) to determine and regulate professional conduct and ethics of Quantity Surveying profession.

Under the Act, the Board of Quantity Surveyors Malaysia makes Rules known as the Quantity Surveyors (Amendment) Rules to supplement and implement the main intention of the Act.

Composition

Section 3 of the Act defines the composition of the Board which consists of the following seventeen members appointed by the Minister of Works :

a) President
b) Five members from public service
c) Five members from private practice to be nominated by the Institution of Surveyors Malaysia
d) Two members from local authority or statutory authority
e) One member from an institution of higher learning
f) One member to be nominated by the Board of Architect
g) One member to be nominated by the Board of Engineers
h) One member to be nominated by the Board of Valuers.

Members stated in (a) to (e) must be registered Quantity Surveyors.

PURPOSE OF REGISTRATION

The objectives of registration of Quantity Surveyors are:-

a) to safeguard the interest of the public seeking Quantity Surveying services against unethical practices and professional misconduct.
b) to enhance public accountability and quality of the Quantity Surveying services provided.
c) to safeguard the interest and rights of the qualified registered Quantity Surveyors as accorded by the Registration of Quantity Surveyors Act against unfair competition from the unqualified ones.
d) to prevent unqualified persons who pose as Registered Quantity Surveyors from carrying out Quantity Surveying Services thereby tarnishing the good name of the profession.

TYPES OF REGISTRATION

a) Provisionally registered Quantity Surveyors
b) Registered Quantity Surveyors
c) Registration of Practising Consulting Firm

Provisionally registered Quantity Surveyors

To be eligible for provisional registration, a person must hold an approved qualification from an approved institution of higher learning recognised by the Board of Quantity Surveyors Malaysia2 and he must be a Malaysian Citizen.

Traditionally the Board of Quantity Surveyors Malaysia has in association with the Institution of Surveyors Malaysia maintained a common list of recognised qualifications for universities, colleges and institutions in Malaysia and overseas for the purpose of registration with the Board. This list was compiled on the premise that the graduate undergo a traditional formal route of study, i.e, spending 3 or 4 years study in the awarding institution of higher learning after obtaining STPM or 'A' Level.

However in recent years, as a result of a more liberal education policy in Malaysia there is a mushrooming of commercially driven private colleges in Malaysia offering courses in Quantity Surveying at various levels of exit in particular at sub-professional levels. It was noted that there is an emerging increasing trend whereby holders of these sub-professional qualifications of either a Diploma or Certificate in Quantity Surveying are able to pursue, complete and obtain a Quantity Surveying Degree after spending about one or two years in an awarding institution or university overseas and in some instances these students even manage to obtain a degree on the list of recognised qualifications

only after undergoing a three (3) years academic study after SPM or O Level. This situation arose because of the inconsistency or non-uniform level of entries offered to holders of sub-professional qualification by the overseas universities.

As a result of this short cut route in obtaining a Quantity Surveying degrees, the Board of Quantity Surveyors Malaysia could no longer accept at face value the Quantity Surveying degrees listed on the list of recognised qualifications. Before approving the provisional registration of a Quantity Surveying graduate, the Board would examine each individual application in respect of the academic pathway by which the degree is obtained commencing at the SPM or 'O' level qualification. If the academic pathway is insufficient and does not comply with the pathway required or imposed by the Board, then the Board of Quantity Surveyors may recommend for topping-up in the form of say, sitting and passing part of the professional examination conducted by the Institution of Surveyors Malaysia (ISM). The conditions for provisional registrations, besides having an approved qualification from list of recognised qualification are as detailed in the Preambles to the list of recognised qualifications. See Appendix A.

In the meantime, the Board plans to carry out its own accreditation for both the local and overseas quantity surveying degree.

Registered Quantity Surveyors

To be qualified for registration as a registered Quantity Surveyor, a person must fulfill the following:-

a) be a provisionally registered Quantity Surveyors and the registration is still valid at the time of application.
b) have obtained sufficient practical experience to the satisfaction of the employer.
c) have passed the test of professional competence (TPC).
d) be a Malaysian citizen.
e) be free from professional misconduct under clause 15 of the Quantity Surveyors Act.

The TPC as aforesaid comprises the following:-

a) acquisition of 2 years approved professional experience which must be supervised by a member or fellow of ISM and/or a Registered Quantity Surveyor. For this purpose, a Work Diary and Log Book must be maintained and certified by the supervisor. Work Diary and Log Book are exempted for candidates who are:
   - probationers of ISM who have passed the Final Examination set by ISM
   - probationers of RICS who have passed:
     i) the Final Part III Examination, or
     ii) the Final Part of Graduate Entry Scheme, or
     iii) the Direct Membership Examination set by RICS and have sat the examination locally.
   - corporate members of RICS and ISM.
b) submission of two Practical Tasks :-
   - one compulsory, i.e elemental cost analysis and tender price indices for 3 projects, and
   - the other from one of the following:
     i) submit 3 returns of questionnaires from 3 contractors, or
     ii) synopsis of candidate's dissertation or thesis of research project, or
     iii) any article publishable in 'The Surveyor', the ISM magazine, or
     iv) any other task proposed by the candidate and approved by TPC panel.
c) attend and pass a Professional Interview.
d) sit and pass a written test.

Registration of Practising Consulting Firms

Under section 7A of the Quantity Surveyors Act, a firm who wishes to practise as a consulting Quantity Surveyor must first obtained registration via a valid Permit to Practise from the Board of Quantity Surveyors. By issuing a Permit to Practise, the Board will be able to keep tabs and maintain a register of Quantity Surveying firms. The Board will also be able to control the formation of these consulting Quantity Surveying firms and regulate their professional conduct.

Types of firms

a) Sole Proprietorship
b) Partnership
c) Body Corporate

Conditions for Approving a Permit45

a) Sole proprietor or partners must be registered Quantity Surveyors with minimum 5 years post-graduate working experience
b) All directors or majority of directors must be registered Quantity Surveyors with minimum 5 years post-graduate working experience and others belonging to a profession allied to the practice of Quantity Surveying.
c) For body corporate, majority number of directors must be registered Quantity Surveyors whose controlling interest must not be less than 55%
d) Sole proprietor, partners or directors must not be a bankrupt.
e) Sole proprietor must be practising full time and cannot be at the same time under employment elsewhere.
f) Partners or directors who are under employment should resign or obtained employer's permission to start their own practice.
g) Sole proprietor, partners or directors must be free from professional misconduct.

Statistic of Registration

Up to January 2001, the total number of registration is as follows:

a) Provisionally registered Quantity Surveyors		590
b) Registered Quantity Surveyors		763
c) Firms: Sole Proprietorship	159	
Partnership	44	
Body Corporate	58	
Total no. of firms	261	

Authorisation by the President

Under section 26(A)(1) of the Quantity Surveyors Act, the President may from time to time in writing authorise any person who is not a registered Quantity Surveyor to carry out quantity surveying services as if he were a registered Quantity Surveyor. This provision caters amongst others, for foreigners who are not qualified to be registered as quantity surveyors in Malaysia but are nevertheless required to work on specified projects in Malaysia as quantity surveyors. A person who is given such authorisation can only be employed as a Quantity Surveyor but cannot carry out a Quantity Surveying Practice.

DISCIPLINARY ACTION

Part IV of the QS Rules spells out the Code of Professional Conduct for the Quantity Surveyors. In the Code, a Registered Quantity Surveyor including a Provisionally registered Quantity Surveyor shall:

a) at all times uphold the dignity, standing and reputation of the quantity surveying profession. (Rules 26)
b) not conduct himself in such manner or commit any act which in the opinion of the Board is undesirable or disgraceful. (Rules 26)
c) have full regard to the public interest in carrying out his responsibility. (Rules 26A)
d) discharge his duties to his employer or client with complete honesty. (Rules 27)
e) not accept nor allow any member of his staff to accept remuneration for services rendered other than from his employer or client. (Rules 27)
f) not offer or accept any illicit commission. (Rules 27)
g) not be a director or substantial shareholder in or agent for any construction firm or company while practising as a consulting Quantity Surveyor unless with the prior written approval of the Board. Where written approval of the Board is obtained, he shall disclose the fact in writing to the client with which he deals on behalf. (Rules 27)
h) not maliciously injure or attempt to injure whether directly or indirectly, the professional reputation, prospects or business of another person registered under the Act. (Rules 29)
i) not canvas or solicit professional employment. (Rules 30)
j) give or offer remuneration or other consideration for the introduction of his professional employment. (Rules 30)
k) advertise in connection with his profession in any manner or form unless with written approval of the Board. (Rules 30)
l) at all time construe and administer provisions of a contract with fairness and act in an impartial manner. (Rules 32)
m) not procure or assist in procuring, or knowingly be a party to procure a permit to practise from the Board by fraud or misrepresentation.(Rules 33)
n) not directly or indirectly supplant or attempt to supplant another registered Quantity Surveyor in private practice.(Rules 34)
o) not directly or indirectly take over the work of another registered Quantity Surveyor in private practice acting for the same employer or client unless he has obtained the consent of that other registered Quantity Surveyor or has been formally notified by the employer or client that the engagement of that other Quantity Surveyor has been terminated in accordance with the provision of the terms of engagement. (Rules 34)

Under section 15(1) of the Act, the Board may order the suspension or cancellation of the registration under the following circumstances:

a) if he is convicted of any offence involving fraud or dishonesty or moral turpitude in Malaysia or elsewhere or
b) if he offers or accepts any illicit commission or
c) if whilst acting in his professional capacity, he at the same time without disclosing the fact in writing to the client, is a director or substantial shareholder in or agent for any constructing or manufacturing company or firm with which he deals on behalf of his client or
d) if his registration has been obtained by fraud or misrepresentation or
e) if his qualification on which the basis of his registration as a provisionally registered Quantity Surveyors has been withdrawn or cancelled by the authority through which it was awarded or
f) if he is found to be of unsound mind or incapable of performing his professional duties or become a bankrupt or
g) if he is found to have contravened or failed to comply with any of the provisions of this Act or Rules or
h) if he fails to observe any restriction imposed during the registration or

i) if he is found guilty by the Board of any disgraceful or infamous act or
j) if he procures, or assists in procuring or is knowingly a party to procuring by fraud or misrepresentation, the approval of the Board for a permit to practise as a consulting Quantity Surveyors or
k) if he conceals or assists in concealing from the Board the existence of any facts or circumstances which if known would entitle the Board to withdraw the approval of permit to practise or
l) if he contravenes, or fails to perform or assists in contravention of restrictions imposed by the Board when granting approval of a permit to practise or
m) if he causes or permits any firm in which he is the principal or partner or director or shareholder to practise as consulting Quantity Surveyors prior to the approval of the Board for a permit to practise being obtained or
n) if he causes or permits any firm in which he is the principal or partner or director or shareholder to continue to practise quantity surveying after the Board has withdrawn its approval for a permit to practise

Under section 15(2) of the Act, before the Board make any order under section 15(1) of the Act for suspension or cancellation, there shall be a hearing at which at least two third of the total number of members of the Board are present and an opportunity of being heard has been given to the Registered Quantity Surveyor.

During the past four years, the Board has received a total of 27 complaints. There were five major cases of complaints wherein investigation was carried out and hearing for each case was held before disciplinary action was imposed on the registered Quantity Surveyor. Out of five cases, one was deregistered, three were suspended from practice and one was issued a letter of reprimand.

The balance of the 22 cases of complaint to the Board involved the following nature:
a) 2 cases - non-refund of tender deposit
b) 7 cases - employing Quantity Surveying firms without permit to practise
c) 3 cases - poor service rendered by registered Quantity Surveying firms
d) 2 cases - supplanting another registered Quantity Surveyor
e) 3 cases - non-registered Quantity Surveyors carrying out Quantity Surveying services
f) 3 cases - registered Quantity Surveyors not professional or diligent in their work
g) 1 case - encroaching into Valuers' services by registered Quantity Surveyor
h) 1 case - dispute between two directors of a firm (internal domestic problem)

Two of the above complaints are still being investigated while the Board is taking action to obtain court injunction to prevent another two persons who are not Registered Quantity Surveyors from carrying out quantity surveying services. The remaining complaints were investigated but were not pursued because there were either insufficient evidence or the complainants settled the matter with the parties concerned.

APPEAL BOARD

Any person may make an appeal within 21 days of the notification of the decision of the Board to the Appeal Board under the following circumstances:5
a) registration refused by the Board or
b) registration approved but is dissatisfied with any of the restrictions imposed by the Board
c) registration cancelled under section 15 of the Act

An Appeal Board as stated under section 20 of the Act consists of:
a) a person qualified for appointment as a Judge of the High Court as a Chairman and shall be appointed by the Yang Di Pertuan Agong.(The King)

b) two other persons appointed by the Yang Di Pertuan Agong.(The King)

CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

A registered Quantity Surveyor is required to keep abreast of the latest development in the profession. He needs to keep track of the continuing development in the profession and to acquire new knowledge and skill instead of remaining stagnant. For this purpose, the Board and the Institution of Surveyors Malaysia organised courses and seminars on quantity surveying for the registered members. The Board has with effect from 1.1.2001 make CPD compulsory for its registered members and a registered Quantity Surveyor is required to participate in the CPD programmes and obtained a minimum of 10 credit hours per year.

A registered Quantity Surveyor will not be able to renew his registration with the Board with effect from 1.1.2002 if he has not obtained the minimum credit hours. He can only seek reinstatement after complying with this minimum requirement.

Senior citizens from the age of 55 years to 60 years are only required to obtain 5 credit hours and those above 60 years old are exempted from this requirement.

A registered Quantity Surveyor is allowed to carry forward excess credit hours obtained in a year of a maximum of 5 credit hours to the following year for the purpose of renewal of registration. A registered Quantity Surveyor is also allowed to apply for an advance of a maximum 3 credit hours should his minimum requirement is not obtained.

OPERATIVE AND CONSEQUENTIAL EFFECT OF THE ACT

As a result of the Registration of the Quantity Surveyors Act, the Board observes the following:

a) Clients/employers approaching the Board seeking advice on the employment of the services of the Quantity Surveying firms.
b) The Board becoming the reference centre for Public Services Department seeking advice on the recognition of degrees before sending students for tertiary education in Quantity Surveying profession.
c) The Board becoming the reference centre for students seeking advice on the recognition of degrees before pursuing their degree in Quantity Surveying profession
d) Clients/employers, other professionals and public in general seeking the Board's assistance in settling dispute and resolving complaints
e) The Board supplying to the Government Statistic Department with annual statistic of Quantity Surveyors in Malaysia
f) The Board recommending candidates as expert witness in cases involving Quantity Surveying services and as arbitrator whenever assistance is sought.

CONCLUSIONS

The Registration of Quantity Surveyors by an Act of Parliament provided the legal foundation for the Board of Quantity Surveyors to uphold and enhance the reputation of the profession. Through this registration, the interest and the rights of the quantity surveyors, the clients and the public at large are protected. The implementation of this Act over the last 33 years clearly demonstrated that it has played its role effectively.

APPENDIX A

LIST OF RECOGNISED QUALIFICATIONS

PREAMBLE

1. The following list of qualifications recognised for registration by the Board of Quantity Surveyors Malaysia (the Board) is applicable to full-time courses conducted at the universities or colleges and by the awarding universities or colleges. The recognition is not applicable to degrees obtained through part-time studies, distance learning courses, twinning programmes, franchising arrangements and bridging schemes unless such courses and programmes have been specifically approved by the Board.

2. Qualifications obtained through part-time studies, distance learning courses, twinning programmes, franchising arrangements, bridging schemes or any other form of advanced entry with exemptions from parts of the course, or which do not require the students to undertake the entire course at the awarding universities or colleges shall be so stated and made known to the Board at the time of application for registration.

3. The recognition is subject to the following:

   (a) review by the Board as and when deemed necessary. As a basic requirement for continued recognition, universities or colleges shall submit to the Board information on any change in the name, structure, syllabi, contents, entry requirements, duration, etc. of the course.

   (b) holders of such qualifications possess not less than five (5) credits in Sijil Pelajaran Malaysia or 'O' Level examinations (or other equivalent qualifications) which shall include Mathematics and Bahasa Malaysia or English. However, holders of such qualifications who are:

      (i) Matured students over the age of 25 (when entering the awarding universities) and who have a minimum of five years post-SPM supervised experience in quantity surveying work approved by the Board, or

      (ii) matured students over the age of 21 (when entering the university, college or institution of higher learning for sub-professional qualification) and who have a minimum of three years post-SPM experience in quantity surveying work approved by the Board

      may be exempted from the requirement

   (c) holders of recognised qualifications obtained via exemptions from parts of the course, or via advanced entry schemes, and who have obtained sub-professional qualifications under (f) hereof, must have undergone a minimum period of:

      (i) two (2) semesters or one (1) calendar year full-time academic studies in the awarding institutions, if the holders have obtained sub-professional qualifications at Diploma level in quantity surveying or related courses through a minimum of four (4) years post-SPM or O-Level studies, or

      (ii) three (3) semesters or one and a half (1 1/2) years full-time academic studies in the awarding institutions, if the holders have obtained sub-professional qualifications in quantity surveying or related courses through a minimum of three (3) years post-SPM or O-Level studies, or

(iii) five (5) semesters or two and a half (2 1/2) years full-time academic studies in the awarding institutions, if the holders have obtained sub-professional qualifications in quantity surveying or related courses through a minimum of two (2) years post-SPM or O-Level studies.

(d) In special cases where a degree is obtained after a period of less than that stated in (c)(ii) or (iii) above, the holder may be eligible for registration with the Board if he has undergone a period of not less than five (5) years approved and supervised experience after obtaining his sub-professional qualification before commencing his degree program.

(e) Universities or institutions taking in applicants with sub-professional qualifications from institutions other than those listed in (f) hereof should seek advice from the Board. Failure to do so may result in graduates with such qualifications being ineligible for registration or be required to sit for special examinations before being eligible for registration.

(f) In respect of sub-professional qualifications in Quantity Surveying or equivalent courses, these must be undertaken at the Board's accredited institutions. For the time being, the following institutions by virtue of their long establishment and leading status, are deemed as the Board's accredited institutions:

(i) Universiti Teknologi Malaysia (UTM)

(ii) Institut Teknologi MARA (ITM)

(iii) Kolej Tunku Abdul Rahman (TARC)

(g) In the interim the Board will require all applicants for provisional registration, other than holders of recognised degrees:

(i) obtained by the full period of studies at the awarding institution,

or

(ii) with sub-professional qualification from accredited institutions in Malaysia and complying with the pathway described in 3(c) or 3(d) hereof,

to undergo a topping-up scheme as tabulated below:

	Category	Topping-up Scheme
(a)	Holders of recognised degrees with sub-professional qualification obtained from the non accredited institution but complying with condition in 3(c) or 3(d) hereof.	Graduate Assessment Programme (GAP) to be approved by the Board during the period of the Test of Professional Competence (TPC).
(b)	Holders of recognised degrees with sub-professional qualification obtained from the Board's accredited institution but not complying with condition 3(c) or 3(d) hereof.	A minimum of one (1) year of Approved Supervised Experience prior to Provisional Registration with the Board, plus Graduate Assessment Programme (GAP) to be approved by the Board.
(c)	Holders of recognised degrees with sub-professional qualification obtained from non accredited institution and not satisfying conditions 3(c) or 3(d) hereof; OR Holders of degrees not on list of recognised qualifications with sub-professional qualification obtained from the Board's accredited institution.	A minimum of one (1) year of Approved Supervised Experience plus passing of one or a combination of papers (as determined by the Board) in the Institution of Surveyors (ISM) Direct final Examination, prior to Provisional Registration with the Board.
(d)	Holders of degrees not on list of recognised qualifications with sub-professional qualification obtained from other than the Board's accredited institution.	A minimum of two (2) years of Approved Supervised Experience plus passing of all or most papers (as determined by the Board) in the Institution of Surveyors (ISM) Direct Final Examination, prior to Provisional Registration with the Board.

ETHICS FOR SURVEYORS IN HONG KONG — IN AN ORGANIZATIONAL CONTEXT

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ABSTRACT

Surveyors are regarded as one of the key professionals involved in construction projects. However, there has been a lack of study on the ethics of surveyors. In this paper, literature of ethics, professional ethics is reviewed. The similarities and differences between ethical theories in the East and the West are examined. Contextual analysis suggests that the identification of groups affect the level of analysis of ethics, such levels include individual, local and cosmopolitan levels. The local level, generally refers to organisations, is emphasised in this paper. A suggested methodology is proposed based on the Behaviour-Performance-Outcome (B-P-O) model to study the ethical climate and culture of organisations where surveyors usually work.

Keywords: Behaviour-Performance-Outcome Model, Contextual Analysis, Ethics, Professional Ethics, Organisational Climate and Culture

INTRODUCTION

In a construction project, a number of professionals are involved. The professionals needed for a particular project will be determined by the nature of the project, but all projects are likely to need architects and/or engineers and surveyors (Rowlinson and Walker, 1994).

There have been many studies on ethics of architects (such as Abramowitz, 1998; Takahashi, 1997) and engineers (such as Alhemoud, 1996; Davis, 1991). However, there is a general lack of such ethical study in the surveying profession.

According to the definition of the Hong Kong Institute of Surveyors (HKIS), the title of a "Surveyor" embraces a number of the disciplines involved with land and its development with buildings. These disciplines include land surveyors, quantity surveyors, general practice surveyors and building surveyors: Land surveyors measure and set out the site; quantity surveyors are concerned with the building contractual arrangements and cost control; general practice surveyors are involved in the valuation, sale, leasing and management of the finished product; building surveyors are involved in the construction and maintenance of the fabric of the building.

ETHICS

Ethics is a branch of philosophy concerning with the evaluation of how right or wrong human actions are (White, 1988). The development of ethics dates back 2000 years to Socrates, the ancient Greek philosopher, who believed that the most important thing is not life, but the good life, Socrates investigated human behaviour, and that's what ethics does.

Ethics deals with the true meaning of such words as 'good, 'right' and 'ought' (Lillie, 1951). . It usually starts with basic distinction between positive and negative, acceptable and unacceptable conduct or behavior (White, 1988; Lillie, 1951).

Martineau (1886) believed that the term 'action' is not limited simply to the body movement of the agent. The motive, intention, purpose and will are parts of the action. Actions are to be regarded as good or bad in proportion to the goodness or badness of the motive. Lillie (1951) quotes Kant that there is nothing in the world or even out of it that can be called good without qualification "except a good will". "Good will", according to Kant, does not mean a mere desire or vague wish that may or may not lead to action, but firm desire and fixed purpose to do something good.

Board (1951) suggests that the rightness of an action may consist in its "fittingness" to the circumstances of the whole situation in which it occurs. It is supported by Board (1951) who contends that there are only right-inclining and wrong-inclining, not right-making or wrong-making, characteristics. It depends on the circumstances. For example telling a lie often tends to be wrong while keeping promises tend to be right. But there may be special circumstances in which it is right to tell a lie and wrong to keep a promise such as for the sake of saving lives.

On the other hand, Annis (1989) emphasizes the meaning of ethics in relationship to morality:

> Ethics deals with what acts are morally right or wrong, what our moral obligations are, what the conditions under which we are morally responsible for our acts, what moral rules or principles are justified, what traits or dispositions are morally good or bad, what are virtues or vices, what things are desirable from a moral point of view and related issues (p.3-4).

Wallace and Walker (1970) contends that 'moral' and 'morality' in ordinary language have no precise and consistent use. There is often disagreement about whether certain problem or principles are or are not moral. The test of a definition of 'moral' or 'morality' should be on how well it serves the purposes for which the definition is required. It is supported by Leisinger (1995), who declares that the concept of situational ethics is highly significant.

According to Moore (1993), the chief purpose of ethics is to influence our actual conduct. He calls casuistry1 'the goal of ethical investigation'. The aim of ethics is to apply its principles in such a way as to guide men in the art of living.

According to Gensler (1998), moral philosophy can deepen our reflection on the ultimate questions of life. This is of value in itself, regardless of its practical benefit. It helps us to think better about morality and sharpen our general thinking processes. We can learn important intellectual skills, think rigorously about fundamental questions and understand and evaluate conflicting points of view. Moral rules are regarded as more authoritative and objective than government laws or rules of etiquette; they are considered as rules that any society must follow if it is to survive and prosper. Lillie (1951) states that the chief value of ethics is not in the guidance it gives in particular cases, but in the development of width and outlook and seriousness of purpose in dealing with moral matters generally.

ETHICAL THEORIES

Ethical theories are tools for analysis enabling individuals to draw their own conclusions. This helps us to organize, prioritize and justify.

There is no guarantee that those who understand the difference between right and wrong will necessarily follow the right. The purpose of studying ethical theory does not necessarily provide answers but to justify principles of judgment. Moral philosophy provides a starting point and method for coming to reasoned judgments. It promises few definite answers to specific problems (Lillie, 1951).

Hong Kong is a city which was under colonial administration for over a century and has been developed as an international business and finance center. People's ethical standards are subject to much influence of both western and eastern countries. The understanding of the prominent ethical theories in the West and East can help us to justify individual and social values of Hong Kong people.

Western Ethical Theory

According to Lillie (1951), there are different classification of ethical theories in the West: absolute and relative ethics; naturalistic and non-naturalistic ethics; teleological and denetological ethics.

The classification of teleological and denetological ethics is commonly used by philosophers (Pettit, 1993; Carlson, 1995; Oderberg, 2000a & b). Teleological theories hold that the rightness and wrongness of an action depends on its consequences or results. A deontological theory holds that the rightness or wrongness of an action depends on the action itself and not on the consequences. The means, rather than the ends, are used to arrive at ethical decisions.

Chinese Ethics

Ivanhoe (1993) distinguishes between western and Chinese ethics. Western philosophers have been much more concerned with the definition of what goodness is. On the other hand, Chinese thinkers focus on how to become good.

Confucius (551-479 B.C.) is commonly hailed as the first teacher in China. There are disagreements about whether the Confucian concept can be regarded as an ethical theory for the Chinese (Ivanhoe, 1993).

De (w) is an early form of Chinese character since the oracle bone inscriptions. De is similar to the concept of virtue which includes kindness or even self-sacrifice (Ivanhoe, 1993). Stewart (1995) compares Aristotle's concept of virtue with Chinese Confucians. Steward contends that the former is concerned on definition of virtue while the latter concentrates on the practical questions of how to teach and achieve virtue. However, Steward claims that Aristotle and Confucius seem to agree on what qualities go to make someone a virtuous person.

The foundation of Confucian ethics in the concept of jen ( ), which is variously translated as love or benevolence or humanism. According to Stewart (1995), there are similarities between Confucian and occidental values. The concept of yen coincides with Christ's injunction to "love your neighbor as yourself".

The proper motives of a person, similar to the view of Kant, is emphasized by Confucian. Acting out of proper motivations is much more important than simply acting in a certain way (Ivanhoe, 1993).

Hsu (1991) contends that Confucian is denetological and denies consequential or rule-based ethics as the emphasis of Confucian:

> None of these translations convey the full connotation of *yen*. It is an inner-based, even inner-endowed, virtue, instead of a visible behavior or an aspect of interpersonal relationship. *Jen* is not necessarily related to a consequence, rather it is an intrinsic characteristic in which its manifested behavior or norms of behavior is only secondary (p.19).

Cross Cultural Ethics

By comparing the ethical theories of the western and Chinese countries, the similarities and differences of ethical values can be recognized.

According to Harbour (1995), a shared core of human moral values of different cultures does exist, but only at the most basic level such as the approval of beneficence, justice, courage and so on.

However, secondary and tertiary moral values differ between societies. Secondary values are elaboration and specifications of the general values in the form of culturally shaped definitions and principles of conduct. Tertiary values are specific codes of behavior. Basic, foundation-level moral values are shared across cultures because they share the same objective property. Therefore, the most unambiguous evaluations are at the primary level such as murder is wrong, courage is good.

PROFESSIONAL ETHICS

As mentioned before, there is close relationship between ethics and morality. Goldman (1980) contends that it is controversial that whether professionals should appeal to the special norms or principles pertaining to professions to override normal relevant moral rights. After considering the literature, there are four possible relationships between professional ethics and general morality:

1. Professional ethics is independent of morality
   Professional ethics represents a distinctive ethical system. This advocates norms which are central to the profession and it permits conduct which are completely different from non-professional morality (Green, 1990).
2. Professional ethics is identical with morality
   Professional ethics should fall under the same general principle of morality as do all other branches of ethics (Gewirth, 1986).
3. Professional ethics is the specification of morality
   It means that universal norms are specified in relation to different situations and circumstances that the professionals encounter. (Bayles, 1989)
4. Professional ethics is functionally related to morality

Professionals, possess specific roles, have additional duties that ordinary people do not have (Bayles, 1989). Conduct which is not in line with general morality, may be permitted if it can be justified by the values shared among the professionals. For example, doctors, when doing surgeries, often puncture people's bodies with sharp instruments, cut them open and remove their internal parts. This is against general morality of not hurting other, however, this is necessary for doctors to perform the specific role of curing patients.

There are broad and narrow perspectives of professional ethics. The narrow perspective restricts professional ethics which mainly deals with ethical dilemmas and problems found in the practice of any professions. Professional ethics is defined in terms of value conflicts occurred in the practice of professional activities (Becker, 1992). The broad perspective suggests that professional ethics encompasses all issues involving ethics and values in the roles of the professions and conduct of professionals in society (Bayles, 1988; Annis, 1989).

ORGANIZATIONAL ETHICS

Ethics in the organizational level is much concerned by scholars.

Okin (1989) specifies the roles of organizations in two ways. Firstly, organizations influence the conduct and lives of those who work there as people spend a considerable portion of their daily lives inside the organizations. It becomes a "formative social environment" skin to the family, shaping the moral conduct and development of members. Secondly, organizations impose a heavy imprint upon society. They affect capital, natural resources, and labor. They also influence national governments and local communities.

In relation to ethics, individual characteristics alone are insufficient to explain moral or ethical behaviour (Kurtines, 1984, 1986). Victor and Cullen (1988) also claims that there is a growing belief

that organizations are social actors responsible for the ethical or unethical behaviors of individual employee. There is an increasing concern for understanding and managing organizational normative systems that may guide the ethical behaviors of employees.

Victor and Cullen (1987) points out that the importance of the process of socialization in affecting individual values and behavior. In an organization, employees learn 'the right way' of behaving through formal and informal socialization. That is, they learn and act according to, in varying degrees, the values that are operative and rewarded in their organizations.

Wolfe (1991) agrees with Victor and Cullen (1987) and points out the potential conflicts between individual and organizational values. He contends that actors in our society are large institutional actors. Employees rely on these institutions for livelihood and do what they are told. Therefore, most employees internalize the pre-existing social order they find in business corporations. Also, large institutions are structured differently from individuals and therefore they often behave differently.

Therefore, Brigley (1995) suggests that ethics in organizations inevitably involve compromises between personal morals and role-governed responsibilities, between individual and organization.

Ethical Climate

Victor and Cullen (1988) claims that ethical climate theory brings ethical content in the mainstream of organization theory which is increasingly concerned by theoreticians and practitioners. From the above views of different scholars, they define ethical climate of an organization as the shared perception of what is ethically correct behavior, based on the organizational values that pertain to ethical issues. Also, Victor and Cullen (1987) found that there was often a dominant climate type in an organization or a group, though organizations did not have single climate types.

Smircich (1983), in studying the relationship between organizational climate and behavior, claims that the term "climate" suggests meteorological climate2. Therefore, ethical climate may characterize organizations in terms of broad normative characteristics and qualities that tell people what kind of organization this is, essentially what the organization values. If so, ethical climate is likely to be associated with attitudes, but may influence decision making and behavior only indirectly as Gaertner (1991) found.

Ethical Culture

Sathe (1983) point out that there are two approaches to study culture: phenomenal and ideational. The former focuses on "observable behaviors and artifacts". Therefore, culture is situated outside the individual and is considered as something that is directly observable within the organization. Meek (1988) regards this as an independent variable in casual relationship. The latter approach focuses on underlying shared meanings, symbols, and values within the organization. Smircich (1983) also supports this view that organizational culture can be viewed as an internal system characterized by shared beliefs and values that, among other functions, serve to shape and guide behavior. In this sense, organizational culture is similar to organizational climate as both of them emphasize organizational values. The classification between ethical climate and culture is not clear.

Trevino (1986, 1990) emphasizes the phenomenal level of culture and applies it in organizational ethics. He regards the phenomenal level as "more conscious, overt, and observable manifestations of culture".

Trevino (1990) further developed the ethical culture construct and proposed direct influences of ethical culture on individual conduct. She defined ethical culture as a subset of organizational culture, representing a multidimensional interplay among various "formal" and "informal" systems of behavioral control that are capable of promoting either ethical or unethical behavior. "Formal" cultural systems

include such factors as policies (e.g., codes of ethics), leadership, authority structures, reward systems, and training programs. "Informal" systems include such factors as peer behavior and ethical norms.

In comparison with ethical climate, it is believed that ethical culture has a more direct effect on ethical conduct. Generally speaking, most conceptualizations of organizational culture are on the expected relationship between culture and conduct Culture helps to establish what is considered legitimate or unacceptable in an organization. Organizational culture is thought to provide direction for day-to-day behavior whether it is an informal organizational control system (Deal and Kennedy, 1982), or an instrument of domination. Also, Liu (1999) contends that culture can be used as a tool for management.

Ethical climate and ethical culture, although somewhat different, are also likely to be related to each other. For example, a culture that supports ethical conduct through codes of conduct is likely to be related to a climate that values rules and laws (Trevino, Butterfield and McCabe, 1998). Ashforth (1985) suggests that climate focuses on the values and beliefs that are known and perceived by work group and/or organizational members. However, the way that values and beliefs become known is through the patterns of observable behavior that results from organizational culture. Such behavior becomes part of the raw material that individuals use to develop climate perceptions.

MODEL DEVELOPMENT FOR STUDYING ETHICS IN THE ORGANIZATIONAL CONTEXT

After reviewing the literature of ethics, professional and organizational ethics. The author believes that ethics is a comprehensive subject which consists of different branches of studies. Professional ethics is an aspect of ethics which is closely related to general ethics but particularly applied to those who are regarded as professionals. O rganizational ethics is ethics that is applied in the organizational context. There are different contexts according to the concept of contextual analysis. The underlying context of study has much influence to the direction and method of a research.

Contextual analysis

The role of the group has long been an important part of social theory and research (Iversen, 1991). Contextual analysis is the study of the role of the group context on actions and attitudes of individuals. Contextual analysis is widely used in social sciences research (Elsie, 2000; Brown, 2000; Kawachi, 1999).

There are different contexts according to the literature. The concept of cosmopolitan versus local orientations was originally developed to differentiate between the two primary reference groups of influential community (Merton, 1957). For local role incumbent, the important reference groups or sources of role definitions and expectations are contained within the social system that one is embedded. The 'locals' were interested primarily in the immediate community. It relates to service orientation to the organization. (Ben-David, 1958). Therefore, the local level is generally referred to the organizational level, which have been mentioned in the previous literature. For the cosmopolitan role incumbent, the sources of role definition are in a social system external to the system in which the actor is embedded. It encourages a practitioner to seek recognition from the group to develop and maintain his expertise. Examples include association and body of law. This maintains a psychological distance from his place of work. (Blau and Scott, 1962).

In relating the local and cosmopolitan levels to ethics, Victor and Cullen (1988) points out that individual is another level external to the focal organization in the sense that the prevailing normative climate supports a referent for ethical reasoning located within the individual. It supports the use of

one's personal ethics or the engagement in self-interested behavior. Also, Victor and Cullen (1988) argues that for cosmopolitan sources of ethical reasoning, it can be generated outside organizations but used inside as part of the institutionalized normative system.

The individual, local and cosmopolitan levels are essential in understanding ethics under different contexts. All these levels can affect our behavior and attitude. Also, there are inter-relationships and conflicts between them which needs our attention.

Model Development for Ethics in the Organizational Context

In order to have a clear idea of ethics, the author would like develop a comprehensive model with links ethics at the individual, local and cosmopolitan levels. Organizational (local) level is regarded as the central part of the model as it has much influence to a person's attitude and behavior. Some scholors (Waters, 1978; Clinard, 1983) suggests that there is much inter-relationship between ethics of individuals and that of the organization. Individuals produce a firm's corporate ethics. In this sense, any study of corporate ethics must include a study of the ethics of the employees of a firm. The ethics of employees result, to some extent, from their own moral characters developed prior to organizational entry. Also, ethics of employees result partly from the adherence to prevailing values of the organization.

The model is useful for studying how surveyors, one of the key professionals in construction projects, exercise their professional ethics under the organizational context.

Behaviour-Performance-Outcome (B-P-O) Model

The model developed is based on the behavior-performance-outcome (B-P-O) model. The B-P-O model is well established in organizational psychology for examining how people formulate goals, evaluate performance and perceive outcomes. Liu and Walker (1998) also applies the B-P-O model in evaluating construction project outcomes.

As the ethical aspects of an organization is gaining more and more concern, the author believes that they are one of the important objectives that need to be achieved for a successful project. Therefore, the B-P-O model can be utilized to develop a model for individual surveyors to evaluate ethical decisions under the organizational context.

In the modified B-P-O model (Fig. 1), behavior is related to the behavior of the individuals. In a construction project, professionals like architects, surveyors and engineers, therefore, plays an active role in evaluating construction projects. Individuals, without other stimuli is guided by their personal ethics. At the individual level, their individual values, conscience, characters, emotion, etc have much influence in what actions they are going to take.

However, according to the Stimulus-Organism-Response (S-O-R) paradigm, there are a lot of environmental factors which are stimulus in affecting individual's decision in ethical aspects which may alter their decisions. (Liu and Walker, 1998).

When referring to the previous level of analysis, such environmental forces, can be further divided into two levels: local and cosmopolitan levels. At the local level, the code of ethics, the ethical culture and climate of the organization would have an effect on individual decisions. At the cosmopolitan level, professional institutes such as the Hong Kong Institute of Surveyors (HKIS) and the law of the society also play important roles. The standard of conduct of professional institutes serves as guidelines for the proper conduct of professionals which helps to maintain the status and reputation of the profession. For example, the standard of conduct of HKIS requires the confidentiality of the client's information to protect the interests of the client. The law of the society also has much influence on ethical decisions of individuals. For example, the Prevention of Bribery Ordinance (cap. 201) prohibits offering, soliciting or accepting advantages without lawful permissions.

The reaction of the members individually within the transformation process constitutes their behavior which, when aggregated over time, generates the performance which produces the outcome which is the success or failure of the project. In ethical terms, the success or failure should be defined in terms of whether it is morally right or wrong. During the evaluation process, the perceived success of failure is the comparison of the level of aspiration with the perceived performance. The level of aspiration may be determined by past experience, religions and cultural factors, rules and procedures in ethical theories, meeting standards of code of ethics in organizations or professional institutes, meeting legal requirements, etc. The evaluation acts as feedback for subsequent goal setting and behavior. (Liu and Walker, 1998)

The refined B-P-O model which is specifically useful for making ethical decisions and evaluating performance in such aspect is as follows:

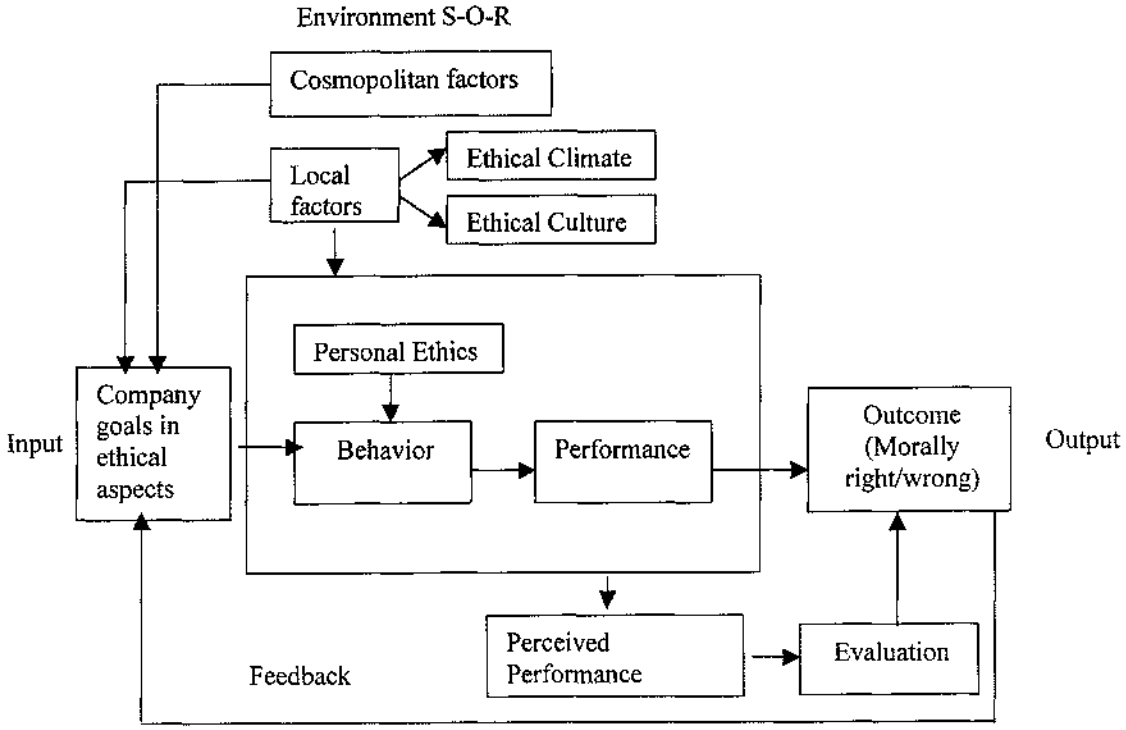

Fig. 1 B-P-O model modified to apply in studying ethics in the organizational context

METHODOLOGY

As the behavior of individuals produces a firm's corporate ethics. In this sense, a study of corporate ethics must include a study of the ethics of the employees of a firm. Though investigating aggregation of individual surveyors' perception of the ethical climate and culture of their employing organization, the author would like to identify:

1. whether there is distinct differences between the concept of ethical climate and ethical culture.
2. find out the various climate and culture types in organizations.
3. whether different types of organizations have different type of ethical climate and culture.
4. if so, to identify the dominant ethical climate type and ethical culture for different types of organizations.

The ultimate aim of the research is to examine how such organizations' ethical climate and culture help to develop professional ethics for surveyors.

The two main types of employing organizations of surveyors are the public sector and private sector. For the private sector, it is further sub-divided into three groups, namely: developers, contractors and

consultant firms. Also, only those who are under a membership (including Honorary Fellows, Fellows, Associates and Student B membership) of Hong Kong Institute of Surveyors will be included in our Sampling. Student A members are excluded as they are undergoing their academic studies and are not full-time employed.

The questionnaires, which measures the ethical climate type and ethical culture of organizations, are used to collect data for the study. In order to investigate the convergence and divergence of the ethical climate and culture constructs, a principal component factor analysis is to be conducted on all items from both the ethical climate and ethical culture measures. This is to identify the various ethical climate and culture types in organizations. Then correlational analysis is used to find out whether the organization's ethical climate and culture are significantly different statistically. It is conducted to determine whether correlations of measures within constructs are higher on average than those between constructs as this would suggest divergence of the two constructs. Analysis of variance (ANOVA) will be used to compare the four different types of organizations for their dominant climate and ethical culture types, if any. However, as the data collection process is still undergoing at the present stage, the results of the data analysis at the time of writing this paper. The summarized research plan is indicated in Fig. 2.

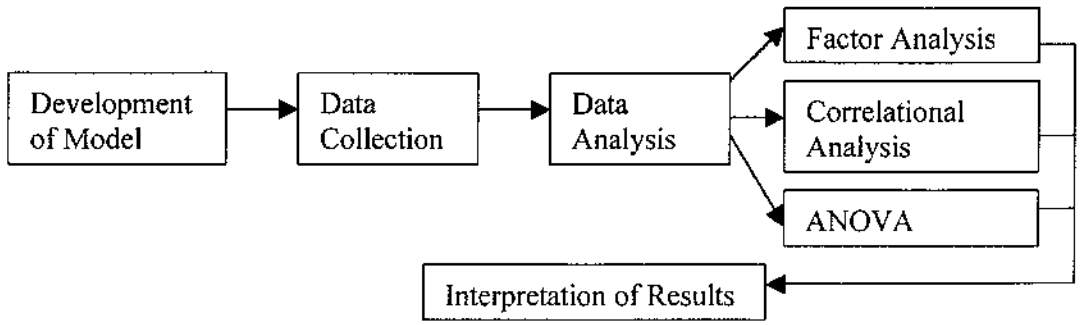

Fig. 2 Summarized research plan

CONCLUSIONS

From a philosophical point of view, an understanding of ethics help us to think and reflect. There are a lot of ethical theories in the West and East that, despite the differences among them at certain levels, guide us towards ethical conduct and affect our ethical values.

Professional ethics, which is a branch of ethics, has close relationship with general morality. Surveyors, who are regarded as one of the key professionals involved in the construction industry, should exercise appropriate professional conducts during their practice.

In society, the influence of groups is very important. According to contextual analysis, there are three main levels of groups: individual, local and cosmopolitan. Though there are conflicts and interdependencies among these levels, ethics at the organizational level is crucial in affecting individual and social behavior. The ethical climate and culture in organizations affect organizational and individual values. This study would help us to understand the roles of organizations in affecting individuals' exercise of their professional ethics.

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[1]The science of applying the standards of ethics to particular kinds of cases is called casuistry

[2]It includes qualities such as temperature, humidity, precipitation, wind, and other atmospheric conditions that can affect individuals (e.g., feelings).