High Order GPS Control in Cheung Sha Wan

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BACKGROUND

The Land Surveying Unit of the Housing Department acquired its second set of GPS receivers in April 1999, making the total number of receivers to five (Trimble 4800 and 4700 models). Soon after the delivery of the receivers, the vendor started to provide local GPS training to our staff. The training was basically in the form of tutorials with limited field exercises. In order to let the trainees have hands-on experience in GPS network survey and the subsequent reduction/adjustment processing, the conception of doing a high order GPS network survey was developing at that time. Once the objective was identified, a series of planning, discussion, exercises and debriefing sessions thus began. And finally, with the concerted effort of all staff, the survey was carried out on 15 June 1999 - all according to plan.

PLANNING AND SURVEY

The rooftop of Cheung Sha Wan Wholesale Market had been identified as the best location for fixing our new control. It was chosen because of its openness to the sky, its low susceptibility to movement and its proximity to the active housing projects in West Kowloon area. The new control, once fixed, could serve as a GPS RTK reference station to our GPS users in the area.

Negotiation with the Director of Agriculture & Fisheries (D of AF) then took place for getting her permission to install a force-centring device over the desired location. The response from D of AF was quick and positive, and the permission was obtained in two weeks. Our force-centring device was made of three metal rings fixed to the parapet wall of the building by epoxy. The rings had been positioned precisely so that a pillar plate could sit perfectly over them. The design of the device and its installation was a simple yet permanent solution.

The network configuration was based on the condition of the geometry and the order of the known control stations. Five first order GPS primary stations previously fixed by the UK, 512 STRE in 1991, had been chosen as the primary controls. The co-ordinates of two new stations, namely Cheung Sha Wan and Lung Fu Shan were determined in this GPS network survey. The former station was the new control to be fixed whereas the latter (being secondary GPS station fixed by SMO) was used as an additional quality check.

Our survey involved the collection of three two-hour sessions of GPS signals over the seven stations simultaneously. The survey operation required the mobilisation of six survey teams. Transportation of personnel and equipment to the stations was mainly by car with the exception of Tai Lam Chung and Stanley where a Government Flying Services (GFS) helicopter was employed. The survey parties were mobilised at 7 a.m., started logging the GPS data at 9 a.m., finished all data collection at 3 p.m., and returned to office by 5 p.m. safely.

EXPERIENCE SHARING

Operational considerations

Besides the technical considerations in designing a GPS survey such as satellite geometry/availability and equipment readiness, operational considerations were found even more important. It included the devising of detailed survey procedures to reinforce participants understanding in achieving results, defining the duties and responsibilities of leaders and members of each survey party to avoid role ambiguities, setting up of a co-ordination centre to look after operational matters and communication, and drawing up of contingency plans to deal with uncertainties and danger incidents.

Liaison

As GPS surveying technique is becoming popular in the survey profession, the chance for other potential GPS users competing for occupying the same trig station has correspondingly increased. As such, it would be advantageous if prior contact with potential users could be made beforehand. Otherwise, a surveyor would be put into a very embarrassed situation if it turns out that the trig station has already been occupied by another surveyor. Bearing this in mind, we had contacted some potential GPS users like the Geodetic Section of SMO, CED, HyD, MTRC and KCRC to minimise such occurrence.

Our survey also relied on the support of other government departments and our GPS vendor - like the Marine Department (MD) for its GPS data from Kau Yi Chau, the GFS for its helicopter service, the Civil Engineering Department for lending us some survey equipment and the PIL Systems Limited for lending us an extra GPS receiver. Furthermore, we had contacted MD to make sure that their GPS reference station in Kau Yi Chau would be operative on the D-day and we had liaised with GFS to make an early flight at 8 a.m. possible.

Safety Concern

Although our ultimate goal was to complete the GPS network survey, emphasis on "staff safety" and "teamwork" had not been ignored, in particular the safety of staff had constantly been regarded as something that could not be compromised, no matter at what cost. All survey parties had been repeatedly reminded of the need to take extra care and work as a team throughout the operation. Other than a full load of equipment and accessories, they had brought with them sufficient food, water, radio, first-aid kit and sun-shade to allow them to execute their tasks for seven hours continuously in a hot summer day (the outside temperature was over 30°C that day).

Tele-Communication

Throughout the operation, mobile phones had played a very important part as they had provided a very reliable channel for regular communication between the professional staff in the co-ordination centre based at the city and the survey parties working in different parts of the territories.

FINAL REMARKS

The successful accomplishment of the survey was greatly attributed to the pre-operation planning and the team spirit of the personnel. The survey provided a valuable experience to our staff at all levels. It gave us an opportunity to conduct a major network exercise, reminded us of the need to plan thoroughly and the importance of team spirit in undertaking any survey operation. Now the co-ordinates of the Cheung Sha Wan station have been fixed, and the control could serve our staff as well as other surveyors working in the area. I take this opportunity to thank our staff for their good work and all the Departments/Companies either mentioned or not mentioned previously, for their advice and support.

Finally, as a note to all surveyors, permission from the Manager of the Cheung Sha Wan Wholesale Market is still required for gaining access to our GPS station.

About the author

Ronnie Chan has served as a land surveyor in the Water Supplies Department, Lands Department (in the Air Survey Unit and Kowloon District Survey Office) and Housing Department. He is currently the Acting Senior Land Surveyor of the Hong Kong District Survey Office of the Lands Department.

An Examination on the Waste Management Practice in the Local Construction Site

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ABSTRACT

Waste management has become an important function of construction project management in line with increasing awareness of environmental impacts from construction wastes. Existing research works and practice have developed various approaches and methods for managing construction wastes, and these measures can be grouped largely into three areas: waste classification, waste management strategies (avoiding waste, reducing waste, reusing waste, recycling waste, and disposing waste), and waste disposal technologies. This study extends the existing approaches to examining the waste management flow practice on construction sites with support from four cases selected in the local construction industry. The examination on these cases was conducted by mapping the waste management flows (WMF). WMFs are used as assistant tools assisting in assessing the adequacy and effectiveness of flow processes of dealing with various construction wastes. WMFs can serve as a vehicle to compare the waste management practice between construction sites, thus both good practice and weak areas in managing wastes can be presented. An effective waste management flow model on construction sites will be developed in further research.

KEYWORDS

Environmental management, construction waste, waste management, waste management flow (WMF), Hong Kong construction.

INTRODUCTION

Waste management in construction activities has been promoted for the aim of protecting the environment in line with the recognition that waste from construction and demolition works contributes significantly to the polluted environment. Craven et al. (1994) reported that construction activity is approximately to generate 20-30% of all waste deposited in Australian landfills. Cotton et al. (1999) suggested that uncollected solid waste such as construction waste has become a major health hazard, yet municipal waste is still the dominating wastes to health hazard as only about 25% of total refuse produce is collected. Ferguson et al. (1995) found that more than 50% of the waste deposited in a typical landfill in UK comes from construction waste. According to Rogoff & Williams (1994), 29% of the solid-waste stream in the USA is construction waste. Poon (2000) showed that the daily generation of construction waste in Hong Kong has been increasing significantly, and suggested action

from the Government to set up intermediate waste sorting plants and on-site sorting of waste for the minimization of demolition waste generation. All these investigations demonstrate that construction business is a large contributor to waste generation and that there is significant potential of protecting the environment through managing construction waste properly.

Significant research works have also been devoted to investigating methods for managing wastes generated from construction and demolition works. Spivey (1974) suggested that proper sorting on waste is an important procedure of properly managing wastes, and he classified construction waste as demolition materials/ packaging materials, wood, waste concrete and asphalt, garbage and sanitary waste, scrap metal products, rubber, plastic and glass, and pesticides and pesticide containers. By sorting wastes out, different techniques can be identified and effectively adopted to deal with various wastages. Bossink & Brouwers (1996) found that construction waste is mainly from the application of various building materials and classified wastes according to the nature and the technology of using the materials, including stone tablets; piles; concrete; sand-lime elements; roof-tiles; mortar; packing; sand-lime bricks and other small fractions of metal and wood. These classifications provide good basis for employing practical methods in controlling wastes on construction site. Other research works has presented various methods of controlling wastes. Chun et al. (1997) discussed the benefits of waste recycling operation over the traditional landfills method in Hong Kong, and proposed the mechanism of changing construction and demolition landfills into construction and demolition recycling operations. Petts (1995) demonstrated the good effectiveness of a more proactive community involvement programme for waste management, and suggested the strategy of consensus building among the public. Sing (2001) investigated the potential of controlling construction wastes by applying environmentally friendly construction methods. And, some typical construction methods are found effective for reducing the waste generation during construction stage, such as using large panel system, applying bamboo scaffolding, and reducing the application of wet trade. These practical methods are also suggested to be able to result in better construction quality and higher productivity. Coffey (1999) suggested that the implementation of waste management system as part of project management functions thus could bring the significant reduction in the generation of construction waste. Lingard et al. (2000) presented the benefits of involving employees' participation in implementing waste management. But he pointed out that employees' participation could only be effective if genius support can be obtained from senior management within the business. Shen & Tam (2001) conducted a comprehensive survey on the implementation of environmental management in construction and found that the issues of waste and environmental management are generally considered less important than construction cost and time in construction industry.

Existing studies present the importance of properly understanding waste management process in order to identify effective methods for controlling wastes. This paper examines the waste management process by using a waste flow technique. This extends the previous waste classifications (Spivey, 1974; Bossink & Brouwers, 1996; Gavilan & Bernold, 1994) to examining waste handling process. The methodology of waste management hierarchy developed in previous studies (Faniran & Canan, 1998) forms the basis in identifying the proper application of various waste management methods at different stages in the whole process of waste handling. Examination on waste flow process is supported with six practical cases.

TYPICAL METHODS IN DEALING WITH CONSTRUCTION WASTES IN HONG KONG

Construction wastes are normally classified into various groups, which carry different characteristics. The understanding on waste characteristics helps to adopt proper management methods for handling different types of wastes. Spivey (1974) categorized construction waste into direct and indirect waste. Direct waste mainly concerns the materials wastage

described as the loss of materials, which are lost during the building process or damaged and cannot be repaired for further use. Indirect construction waste is defined as a monetary loss for damaged or lost materials. This study focuses on direct construction waste. Previous studies have developed various classifications on construction wastes (Spivey, 1974; Bossink & Brouwers, 1996; EPD, 2001). A typical classification presents five categories, municipal solid waste, construction and demolition waste, chemical waste, special waste and other solid waste.

In general, municipal solid waste covers a wide range including plastic, paper, paperboard, textile, rubber type, organic, aluminum, ferrous metals, non ferrous metals, glass, wood, etc. Considering generating sources, municipal solid waste is divided into domestic waste, commercial waste and industrial waste. Domestic municipal solid waste refers to household waste generated from daily activities in institutional premises and refuse collected from public cleaning services. Public cleaning services are normally provided by governmental departments, for example, in Hong Kong, collection of dirt and litter by the Food, Environmental and Hygiene Department (FEHD), collection of marine refuse by the Marine Department and collection of country parks wastes by the Agriculture and Fisheries Department. Commercial waste is the waste arising from commercial activities taking place in markets, shops, restaurants, hotels and offices etc, and this kind of waste is normally collected by private waste collectors. However, certain amounts of commercial waste are mixed with domestic wastes and collected by the FEHD in Hong Kong's case. Furthermore, industrial waste generally refers to that from other industrial activities than construction and demolition, usually collected by private waste collectors except that some industrial sectors may deliver their industrial wastes directly to landfills for disposal. Of these various municipal solid wastes there are bulky waste items like furniture and domestic appliances, which may come from residential premises, commercial and industrial activities. These bulky wastes are usually collected separately.

Wastage from construction and demolition activities is usually handled differently from those municipal solid wastes. Construction and demolition wastes (C&D-w) include waste arising from all construction related activities such as land excavation or formation, civil and building construction, site clearance, demolition activities, roadwork and building renovation. C&D-w is in the form of various types of building debris, rubble, earth, concrete, timber and mixed site clearance materials. In Hong Kong, C&D-w is divided into two groups according to the level of the inclusion of inert waste. Type I C&D-w, as stated in landfill contracts between the Environmental Protection Department (EPD) and the constructor concerned, is defined as containing no more than 20% by volume, or 30% by weight, of inert materials (EPD, 2001). Inert materials comprise dirt, soil or mud, concrete, reinforced concrete, asphalt, brick or sand, cement plaster or mortar, aggregate, inert building debris, and rock or rubble (EPD, 2001). Type II C&D-w consists of more than 20% by volume or 30% by weight, of inert material content and is not normally accepted by landfills, and can be used for proper site formation.

Furthermore, chemical waste and other special waste from construction activities are strictly regulated for special treatment in the Waste Disposal Ordinance (WDO, 2001). Chemical waste contains chemical or in kind contents, which can cause pollution to the environment or become a risk to health. In WDO (2001) special waste is described including abattoir waste, animal carcasses, asbestos, clinical waste, condemned goods, livestock waste, sewage treatment and waterworks treatment sludge, sewage works screenings and stabilized residues from the Chemical Waste Treatment Centre. The separation of the chemical and special wastes helps the adoption of special methods for dealing with them before going to dumping areas. There are other types of solid waste that have not been covered in the above classifications, such as coal ash, dredged mud and excavated materials; they are also normally disposed of at dumping areas. Based on the above discussion, the overall profile of construction wastes

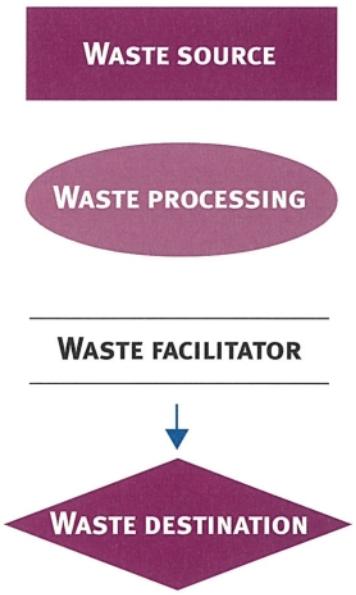
and typical methods of dealing with them can be presented in a table format, as shown in Table 1.

TABLE 1 CONSTRUCTION WASTES AND TYPICAL METHODS OF DEALING WITH THEM

Type of waste	Specific description	Typical handling method
Municipal solid waste	Timber & paper, concrete & stone, chemical substances, plastic waste, wood, glass, water, metal, aluminum, mild steel, stand steel, copper/ bronze, etc.	Recycle, reuse, dumping areas or incineration
Construction & demolition waste	Demolition materials, packaging materials, waste concrete and asphalt, garbage and sanitary waste, scrap metal products, rubber plastic and glass, pesticide containers, etc.	Recycle, reuse, dumping areas or incineration
Chemical waste Special waste	Oil, chemical liquid, etc. Special chemical wastes, etc.	Special treatments to recycle Special treatment before going to dumping areas
Other solid waste	Abattoir waste, animal carcasses, asbestos, clinical waste, condemned goods, livestock waste, sewage treatment and waterworks treatment sludge, sewage works screenings and stabilized residues, etc.	Special treatment before going to dumping areas

INVESTIGATION OF THE WASTE FLOW PRACTICE ON CONSTRUCTION SITES

The discussion in the previous sections identified the classifications of construction wastes and the typical methods of dealing with them. This section investigates the way construction wastes flow onto construction sites. This research team has examined four construction projects in the Hong Kong construction industry and mapped out the flow processes in managing the construction wastes in these projects. The major information presented in each mapping includes four key elements, namely, waste source, waste processing, waste facilitator and wastes destination. In order to conduct comparative analysis between different waste management practices, the following symbols are designed for representing the four elements:



By using the above symbols, the four waste management practices are mapped and presented in figures 1, 2, 3 and 4 separately. It is considered that mapping presentations have the advantages of being easily understood. These mappings are constructed based on the observations and discussions with the site management staff, who were operating the projects concerned. The evaluation on the advantages and weaknesses of each waste management practice is given in the following discussions used in mappings.

Case Study I

This was a high rise residential building project at superstructure construction stage and the mapping of waste management practice for this project is shown in Figure 1. The typical weaknesses observed in this waste management practice include: (1) No recycle consideration about waste materials; (2) Serious dusty and air pollution from uncovered handcarts in delivery; (3) Intensive labour works was involved in waste handling; (4) Adopting less mechanical waste handling system and more time consumption on waste handling; (5) No packing or container for waste collection thus double waste handling; and (6) Not an environmentally friendly handling method due to using plastic bags for waste collection.

Nevertheless, the advantages in this waste management practice are considered as: (1) The simple process for waste management, namely, fewer processes for handling wastes on site; (2) Less investment on setting up waste handling / disposal device on site as less energy consumption device was used; (3) Generation of income from the sale of waste materials; and (4) Effective waste reusing as waste materials were properly sorted out.

Fig.1 Mapping of waste management practice for a housing project

Case Study II

Case study II concerns a three-block private housing estate at finishing stage. The mapping of this waste management practice is shown in Figure 2. The problems observed in this practice include: (1) Highly involving intensive labour works thus expensive in waste handling; (2) Using plastic bags for waste collection thus not an environmentally friendly handling method; (3) No sorting out and no recognition to the benefits of waste recycling and reuse; (4) Involving more resources input including manpower, lorry, hoist, rubbish chute; (5) Scattered locations for collecting wastes requiring more manpower thus more costly for waste handling; (6) Engaging higher chance of safety accidents by allowing more people to collect waste materials within the construction site; and (7) Requiring more coordination works for all waste handling activities on the whole construction site, thus increasing the project overheads.

The advantages in this practice were suggested by the project manager concerned as: (1) Use of energy saving device for waste disposal such as rubbish chute; (2) Less air pollution by using plastic bags and rubbish bins, reducing dust dispread; and (3) Pack of waste material increasing the efficiency of waste handling than dealing with pieces of waste materials.

Fig.2 Mapping of waste management practice for a residential project

Case Study III

The mapping of waste management practice in case study III is shown in Figure 3. Typical problems involved in this practice include: (1) No proper sorting out for waste materials and little recognition to the benefits of waste recycling; (2) No packing or container for waste collection, thus involving double handling in waste collection; (3) Disposal of large size waste materials presenting the chance of blockage inside the refuse chute; (4) The disposal of large-size waste material by refuse chute causing noise pollution; (5) Involving higher dumping charges due to the increase of the volume of waste materials without proper sorting; and (6) Investing more resources on constructing the special refuse chute and the use of waste-delivering lorry.

Some advantages observed in this practice include: (1) Efficient and time saving in handling waste materials through refuse chute and handcart; (2) Involving less labour works in waste material handling; (3) Dusty and air pollution under control by use of refuse chute with running water; and (4) Reusing the usable materials thus engaging an environmentally friendly waste management practice.

Fig.3 Mapping of waste management practice for a residential project at RC structural stage

Case Study IV

Figure 4 shows the mapping of waste management practice in case study IV, which was a large housing estate at finishing stage. The problems discussed in this case include: (1) Involving intensive labour work for waste materials handling; (2) Long traveling distance of delivering waste materials to rubbish collector thus increasing time consumption for waste handling; (3) Lack of using mechanical device such as refuse chute, thus low efficiency in waste handling; (4) No consideration for recycling waste materials; and (5) Serious problem with dusty and air pollution due to uncovered waste in handcart during delivery.

Advantages in this practice were suggested as: (1) The use of open-top rubbish collector reducing double handling of wastes (as it was connected directly to the lorry delivering wastes to dumping areas); (2) Logic and simple handling processes of waste materials, easily identifiable wastes collection locations, thus better efficiency of waste handling; and (3) Clean construction site as wastes were properly collected and stored in rubbish collectors, and reusable waste materials were tidily placed.

Fig.4 Mapping waste management practice for a hotel project at finishing stage

IMPROVING WASTE MANAGEMENT FLOW MODEL IN CONSTRUCTION PRACTICE

The investigation on the four case studies in the previous section demonstrates that different site management practice engages a different waste management model. The identification of their weaknesses and advantages provide valuable references for investigating a more effective WMF. Whilst such an effective WMF should be able to incorporate the advantages embodied in the existing practice, the major guidelines for constructing such an effective WMF on construction site are proposed as follows:

- Minimize the cost used for waste management by i) minimizing the number of processes for handling waste; ii) involving less labour hours/ efforts for handling waste; iii) using more mechanic means in handling waste; iv) choosing low energy consumption tools/plants for handling waste; v) avoiding double handling operations; and vi) engaging an effective waste-handling supervision;

- Protect the environment in the process of handling waste by i) controlling the waste pollution (air pollution, water pollution, noise pollution and other types of pollution) to its minimum level; ii) maximizing waste recycling; iii) maximizing waste reusing; iv) promoting environmental friendly culture among working staff; v) keeping tidy and hygienic on construction site; and vi) adequately purchasing building materials and facilities;

- Minimize the time for waste handling by i) reducing the number of waste handling processes; ii) simplifying each waste handling process; iii) avoiding double-handling operation; iv) using more mechanical means and less labour operations; and v) using higher-capacity equipment to handle wastes.

The implementation of these major principles is suggested through a three-layer system as shown in Figure 5, called waste management leveling system (WMLS). Various waste handling processes are conducted at different levels by involving different parties.

At level 1, various types of wastes will be generated, and sub-contractors are engaged in collecting and sorting out the wastes generated at various locations. Much of the sorting-out activities will be conducted for selecting. Useful waste materials such as marble and wall tiles, which can be used for repair works or stored as spare parts. Majority of waste reduction can be gained at this level. At level 2, the main contractor will co-ordinate and assemble general wastes. Still with significant planning and implementation of on-site sorting-out, the amount of waste can be reduced at this level by properly coordinating different specialist trades and adopting effective management techniques such as (1) using open-top lorry container to avoid double handling or loading waste materials; (2) collecting waste material to one collection point (e.g. an open-top lorry container within construction site; (3) utilizing rubbish chute to increase efficiency of delivering waste material; (4) reducing energy use to handle waste material by using list appliance; (5) sorting out waste at waste collection points such as open-top lorry containers before or after normal work hours, or during lunch hour, thus minimizing the chance of accidents happening; (6) reusing the usable wastes or recycling valuable material for sale; and (7) delivering the residual waste to dumping area/ reclamation area. At level 3, whether waste should go for waste destinations are defined and dumping area or for reclamation will be specified in relevant governmental policies. Sorting-out can be further conducted at level 3, thus specific find disposal measures can be selected for different types of wastes.

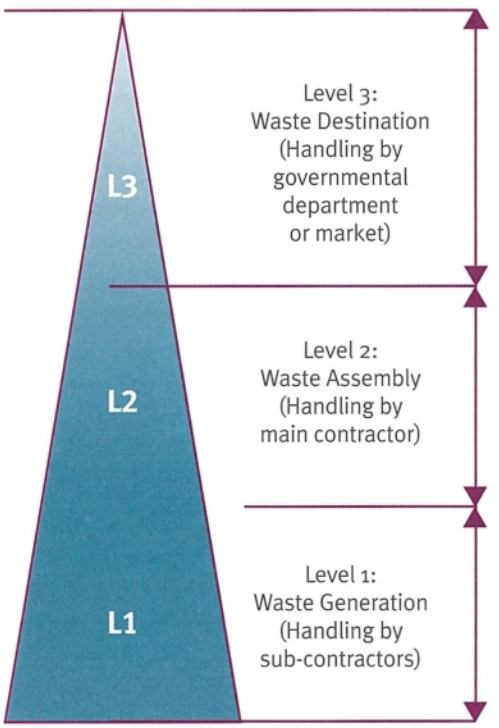


Fig.5 Waste Management Leveling System (WMLS)

DISCUSSION AND CONCLUSION

The benefits of implementing waste management in construction activities are multiple. McDonald et al. (1998) suggested that the main advantage of engaging waste management is cost saving, 50% of handling cost could be saved in their case studies. However, the cost reduction by controlling wastes is difficult to achieve in short term. Shen & Tam (2001) found that one of the most serious barriers to constructors in the Hong Kong construction industry in implementing waste management is increasing costs due to additional investment on staffing, technologies and facilities. Furthermore, in the current waste management practice, governmental enforcement seems to be the driving force that pushes most contractors to implement proper waste management. Contractors normally seek for a way that can satisfy the minimum requirement imposed

by governmental restriction. This waste management practice is considered of limited effectiveness from the long term's viewpoint if there is a lack of contractors' initiative and public awareness. Contractors' active contributions are essential for the successful implementation of waste control and environmental management mission. The investigation on four case studies in this paper demonstrates that different site management practice engages a different waste management model presented in a mapping or WMF. The identification of their weaknesses and advantages provide valuable references for further research in developing a more effective and standard waste management flow model. Whilst such a standard model should be able to incorporate the advantages embodied in the current practice, the major guidelines for constructing such model are proposed in this paper. Building up a more effective and standard waste management flow model for construction site is the immediate future study by this research group.

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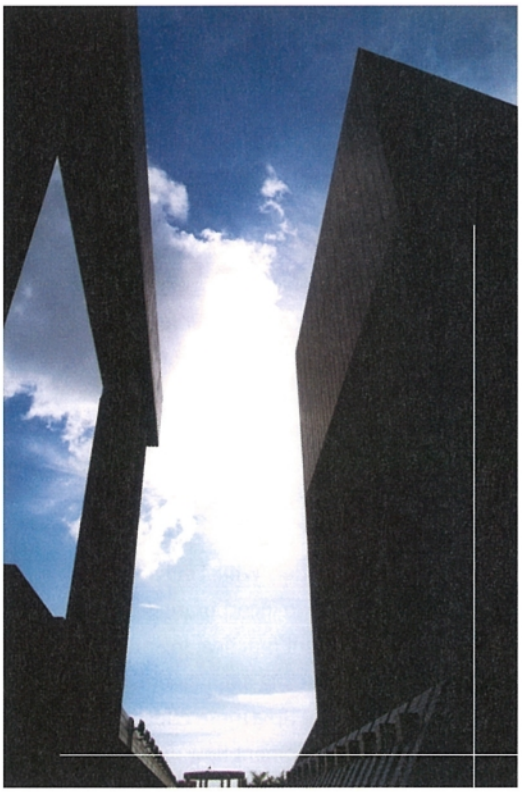

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Risk Allocation of Unforeseen Ground Conditions and Underground Utilities in Construction Contracts – Time for a Rethink

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INTRODUCTION

"A risk is a possibility that a particular event might or might not happen, or "eventuate", and whose consequences cannot be predicted with accuracy. In construction contracts, both parties take many risks, of human error and of the unexpected. Any risk can result in the need for a change to the original contract and the contract must make provision for such changes to be made. If it does not do so, adequately and fairly, the changes will result in claims".[1]

Recently, the Government of HKSAR has commissioned a Construction Industry Review Committee ("CIRC") to review the current state of the construction industry of Hong Kong and to identify specific actions and good practices to improve the industry's efficiency and cost effectiveness. In its report - Construct for Excellence, CIRC has identified various problems the local construction industry has been facing and suggested a packaged improvement programme to deal with these problems.

In particular, one of the major problems, which CIRC has identified, is the onerous or unfair allocation of risks in construction contracts, which place the risks of unforeseen ground conditions and third parties' lawful interference to contractors. The result of which is the instigation of disputes and claims by contractors.

This paper aims to further research the problems associated with unfair allocation of risk in construction contracts and the international practice of the management of the risks of unforeseen ground conditions and third parties' lawful interference (underground utilities) to contractors in construction contracts. Another aim of this paper is, through research into the international practice of dealing with the above, to justify that project owners or principals should bear these risks such that better project performance can be achieved.

THE IMPORTANCE OF GOOD RISK MANAGEMENT AND EQUITABLE RISK ALLOCATION IN CONSTRUCTION CONTRACTS

Many academic commentators and industry practitioners have proposed that proper risk management in construction contracts can help alleviate the chance of disputes and claims being raised. The typical view is that many of the disputes arise because the owner traditionally uses exculpatory and hold-harmless clauses to avoid obligations in construction contracts. This may not be in the owner's best interest - when contractors are obliged to assume risk, they would include contingency costs for events that often do not realise.[2] Another problem is that during a period of economic downturn when work is scarce, contractors tend not to price the risks and seek instead to submit claims, if the risks materialise, to mitigate their loss.[3] On the other hand, experienced contractors who realise and price the risks are often more difficult to bid successfully for work than contractors who either are not experienced enough to realise the risks or purposely ignore these risks in order to win their bids. This often leads to poor workmanship, disputes, claims and project delays.

Some suggest that to require contractors to price those risks such as unforeseen ground conditions and underground utilities, is just like asking them to gamble on their bid price. It is certainly not in the public interest and a contractor's losses on a contract must be paid for in the long term either by his other customers or by his creditors when he becomes insolvent.[4]

Therefore, it would be better to project owners' best interests if they assume more of the risks such that competition is improved, price certainty is maintained[5] and claims or disputes are reduced.

It can be seen that proper risk management philosophy and techniques are of paramount importance. Risk management may be defined as *"being the process of recognising the factors which create risk and, where possible, organising resources and actions in such a way as to avoid risks when possible, minimise the undesirable consequences of the risks which cannot be avoided, and maximise any benefits which may result from them"*.[6]

I do not intend in this paper to discuss in detail the technique of risk management. However, some concise guidelines would be useful here. Max Abrahamson has suggested that a party should bear a construction risk where:

"1. It is in his control, i.e., if it comes about it will be due to wilful misconduct or lack of reasonable efficiency or care; or

2. He can transfer the risk by insurance and allow for the premium in settling his charges to the other party ... and it is most economically beneficial and practicable for the risk to be dealt with in that way; or

3. The preponderant economic benefit of running the risk accrues to him; or

4. To place the risk on him is in the interests of efficiency (which includes planning, incentive, innovation) and the long term health of the construction industry on which that depends; or

5. If the risk eventuates, the loss falls on him in the first instance, and it is not practicable or there is no reason under the above four principles to cause expense and uncertainty, and possibly make mistakes in trying to transfer the loss to another.

The job of trying to balance the five principles in practice is the hard one.... But at least it is best to work from declared principles rather than undeclared and perhaps unconscious prejudices".[7]

It is also thought that fair allocation of risks in construction contracts directly impacts upon project performance and relationship between project parties. In deciding the distribution of risk between project owner and contractor, one of the factors that should be taken into account in deciding contractual arrangements is to encourage co-operation and goodwill between the parties during the currency of the contract. The project owner should bear in mind the need to foster a comprehensive and capable construction industry in order that there remains a

pool of experienced and financially stable contractors ready for future work. The short term philosophy of driving as hard a bargain as possible on a contract may be counter-productive in creating an atmosphere of hostility, which generates an excess of claims and a reluctance to tender for further work.[8]

THE SITUATION IN HONG KONG - THE RISKS OF UNFORESEEN GROUND CONDITIONS AND UNDERGROUND UTILITIES

The Risks of Unforeseen Ground Conditions

Whilst the purely topographical matters of boundaries, proximity to roads and so on can readily be seen and understood, it is the "soil risk" or the risks of unforeseen ground conditions, the unknown conditions below the surface, which represents the major site risk. A familiar though rather unsatisfactory way, is for the project owner to state in the contract that:[9]

"the Contractor shall be deemed to have visited the site and satisfied himself that he has allowed in his price for everything necessary for the completion of the Works".

The implication of such a clause is that the contractor is expected to have allowed in his tender price for all the underground risks he might encounter, whether or not they have been identified, and whether or not he has had a real and effective opportunity to make any tests on the site before tendering. Such an approach is an attempt to allocate the risk to the contractor without either party having any real knowledge of the magnitude of the risk involved.[10]

On the other hand, extensive site investigation work may have been carried out by the project owner under an earlier contract and the results of such investigations made available to the tenderers. Even in such cases, however, although the risk of the unknown is diminished, it is never completely avoided. There always remains a risk of the unexpected because no site investigation, however thorough, can ever disclose fully all the details of the ground under the surface. A borehole log describes the site only at the position of the borehole and the circumstances between boreholes can only be determined on an inferential basis. Test samples, however numerous, are only descriptive of the areas from which they were taken and can only be informative within the limits of sampling statistics.[11]

There is also a secondary aspect of the risks associated with site investigations, which can present a dilemma of choice to the project owner and that is the question of how the results should be interpreted. Since interpretations of the results of site investigations can differ and can even be contentious, the project owner will be reluctant to present results as incontrovertible facts. He will, nevertheless, want to ensure that his tenderers are as fully informed as possible. The compromise, which is sometimes employed, is to make the site investigation results available, but to say: *"here are the results, provided in good faith, but the responsibility for interpretation of what they mean shall be that of the tenderer"*.[12]

Another common device of placing the soil risk on the contractor is to say: *"here is the information currently available, if the tenderer considers it insufficient he should allow in his price for such additional investigation as he considers necessary."* This represents a problem for a tenderer. Not to say the tenderer would not normally have the real opportunity to carry out his own pre-tender site investigation, he simply will not wish to increase his tender price, and risk losing the competition. The only alternative is to take a chance and hope that what he considers insufficient information will prove to be adequate.[13]

In the public sectors, the Grove Report considers that Clause 13 of the General Conditions of Contract for Civil Engineering Works ("the GCC") places the risk of unforeseen and unforeseeable subsurface conditions (and other risks) on the contractor regardless of whether the contractor was misled by insufficient or inaccurate information given to him by the Government. Thus, the contractor must bear the financial consequences (including liquidated damages for consequent delay) of discovering the unexpected, whether it be natural (e.g., faulting,

fracturing, quicksand vice rock, rock vice soil, voids, material prone to settlement, peaks and valleys in rock profile), toxic or hazardous (e.g., military ordnance, asbestos, hydrocarbons, PCB's, industrial and human wastes), or manmade (e.g., utilities, pilings, artifacts, antiquities, out-of-specification embedment in reclamation areas).[14]

The Grove Report further observes that contractors regard this provision of the GCCs as the most repugnant of all. The risk materializes frequently in the form of utility clashes, but in that form is often mitigated through variation of the works which attracts contractor compensation thereby reallocating the risk to Government. In its other forms it is to be feared as a risk that cannot be foreseen, or if foreseen evaluated through estimating, and because it is potentially catastrophic. Fortunately the risk in its other forms is unlikely to materialize on most public works projects (which implies that neither party should be concerned about bearing it), but it arises often enough (usually on civil or building foundation works) that it must be considered an important risk allocation issue.[15]

The above view seems to be shared by contractors - contractors' typical view on their inability to cope and price the latter form of risk mentioned in the preceding paragraph was concisely spelled out by Steve Tennant: *"so the Contractor's view is not just that he wants to complain about his apparent inability to be able to claim for Ground Conditions. No, the Contractor's view is that he should be able to claim for all physical conditions (other than weather conditions or conditions due to weather conditions) or artificial obstructions which conditions or obstructions could not, in the opinion of the Contractor, been foreseen by an experienced contractor."*[16]

Philip Nunn, with his more than 15 years of legal experience of dealing with the above matter, is of the view that:

"the policy behind the [GCC]s was therefore to provide Conditions of Contract, which were firstly clear and unambiguous and secondly, allocated risks in such a way that the Government was able to fix as far as possible the cost of the project at the outset.

It was thought that to impose most of the risks on the contractor would lead to the final contract sum being largely predictable subject of course to variations and other normal adjustments to the final account. It was also hoped that the additional clarity of the conditions, which were largely based on the ICE Fifth Edition, would lead to fewer contract disputes. Unfortunately, ...this is not how things have worked out in practice. Whilst...the [GCC]s and their successors have proved to be reasonably clear in their terminology the second aim of the Government in imposing risks on contractors and thereby attempting to fix project budgets and prevent cost overruns has failed miserably."[17]

He is then of the view that the attitude that imposing the risks of unforeseen ground conditions on contractors leads to price certainty and cost saving is incorrect - such risks should be borne by project owners. He puts forward three reasons in justifying the above proposition, namely:

"(i) If unforeseen ground conditions occur, the employer or its consultants should be able to quickly give instructions to deal with the situation with the minimum of delay and cost. The employer and its consultants should have the knowledge and ability to speedily resolve the problem. They should have more knowledge of the site and its ground conditions then the contractor and should be fully aware of the best and most effective means of dealing with each situation as it arises.

(ii) If necessary, action can be taken to accelerate the works to catch up for lost time. In the situation where the contractor bears the risk, the employer and the consultants will be reluctant to take any initiative and hence it is often the case that a project drifts out of control while the contractor either argues the toss about risk allocation or alternatively decides himself upon the most cost-effective way of dealing with the problem. This wastes time.

(iii) It is the Government's project and the Government's site. Also the Government has available resources. Why shouldn't the Government pay a fair price for the project?"

He observes that the more money the contractor stands to lose on a project the more likely he is to attempt to challenge the employer. In every contract, there are possible loopholes or ways out. A dispute prone project will often lead to significant extra costs and long delays. It is almost impossible to properly price the risk of ground conditions and many contractors will either gamble or add some kind of uplift to their rates (or include a contingency sum). This leads to higher prices whether or not the risk eventuates.

The above views are perfectly in line with my research findings set out in the previous section of this paper and that in the Grove Report[18].

Third Party Interferences - Underground utilities

In Hong Kong, utilities undertakers like the Water Supplies Department and the Drainage Services Department are required by law to place new installations and relocate old ones as necessary to accommodate public works projects at the cost of the utility.[19]

It is described that urban Hong Kong is serviced by a maze of utility undertakers' apparatus, which has been haphazard.[20]

It is observed that interference from utilities undertakers' apparatus has much greater significance in civil engineering construction than it does in building. Building is usually carried out in small footprint sites where the only utility problems relate to bringing in the services required in the building. Civil engineering, particularly highways, railways, land drainage and trunk water supply has typically large, or extended site areas and the interference with and from utilities undertakers apparatus can be very substantial.[21]

In civil engineering, like the effect of unforeseen ground conditions, the effect of lawful interference by third party - underground utilities can have a devastating and dramatic impact on progress and cost. It is never possible, at the design stage, to do sufficient investigation of large or extended civil engineering sites to rule out the possibility, or even probability of unforeseen circumstances. [22]

However, in practice, it is deemed the responsibility of the contractor to determine what is in place, and to make arrangements with the appropriate utility for performance of the undertaking. For instance, in the Government Form, GCC Clause 63(d), by exception, disallows payment to the contractor for unreimbursed expenditure caused by disturbances to the progress of the works by a utility undertaker. GCC Clause 50(1)(b)(ix) allows an extension of time if the utility undertaker fails to perform "in due time" so long as the contractor has taken all practicable steps to cause the utility undertaker to do so. Thus, the contractor must bear the financial consequences (excepting liquidated damages for consequent delay) when a utility undertaker fails to pursue planned locations and relocations with due diligence. This provision of the GCCs is also highly controversial. The risk materializes frequently because (i) Hong Kong utility lines are everywhere and (ii) Hong Kong utilities undertakers rarely meet contractors' expectations and desires for prompt commitments (regardless of fault by the utility undertaker or unrealism by the contractor).[23]

It is suggested that the risk to civil engineering contracting, which arises from interference from existing or future utility apparatus is largely outside the control of the contractor. Further, there is usually little that he can do to manage the risk. The risk is not insurable. In the absence of detailed underground utilities information in tender documents, it is not possible, in the time normally allocated for tendering civil engineering works in Hong Kong, to make a sensible prediction of the standard or location of the underground utilities which will be encountered nor what the utility undertakers' intentions are regarding new or upgraded plant. At present, the contractor is required to take a guess, perhaps consult a fortune-teller or see what the tarot cards say. It is therefore

proposed that the risk of interference from utilities' apparatus is a risk that the promoter of the scheme should bear.[24]

Debates on the above issues relating to the allocation of risks of underground utilities has long been raised in the mid-1980s when the Joint Discussion Group ("JDG") - a cross industry talking shop which was promulgated to review such matters as risk placement in Government contracts. Recently, a Utilities Working Group ("UWG") was formed in early 1996 with a remit to:[25]

1) review the distribution of risk with regard to contract arrangements for work involving the installation/relocation of utility services under Government contracts; and

2) identify and quantify the consequences of problems attributable to present contract arrangements and to recommend solutions to the Contracts Committee.

A sub-group of the UWG has identified the following problems:[26]

1) insufficient time in tender period to undertake useful research on utilities;

2) utilities undertakers do not, and are not capable of responding in typical tender periods;

3) therefore the contractor only has information available in tender to work and plan from;

4) contractors have no control over time actually taken by utilities undertakers to complete their works although they have to coordinate their own and utilities undertakers' works on site.

The UWG then produced its first report in December 1996. This report gave recommendations as follows:[27]

1) The Hong Kong Government should follow the best practice and provide the best possible information in tender documents including:

   - Details of existing, abandoned, new, diverted, upgraded, lowered/raised utilities undertakers apparatus as current at the time of tender;

   - Periods required by utilities undertakers to do their works and periods of notice to start, and including any necessary sequence or timing including sequencing of multiple utilities undertakers apparatus in the same area;

   - Entrustment of the utilities undertakers works whenever possible.

2) This information should be at the risk of the Hong Kong Government, changes subsequent to tender should constitute a variation.

3) It was also desirable that best practice should include:

   - Designer's assumptions as to likely methods and timing of construction - agreed to have no contractual status if included in tender documents;

   - Pre-tender investigation of utilities undertakers apparatus where they were particularly complex or uncertain;

   - Pre-contract clearing of utilities undertakers apparatus away from major sites (as MTRC practice) recognising that a balance must be found in relation to repeated road openings.

4) The Project Administration Handbook should be amended to reflect best practice. The superseded Civil Engineering Manual was a better model;

5) Records of utilities undertakers apparatus were presently unsatisfactory, the opportunities presented to upgrade information by radio-location and GIS systems should be explored.

When compared with those made in the Grove Report, the above recommendations share the same philosophy that risks should be borne by the party who can best control them. Whilst the Hong Kong Government accepts that it should carry out a review of the problems arising from utilities undertakers apparatus interference and develop administrative procedures for identification of existing utilities undertakers apparatus, proposed utility works including any temporary works, land requirements

and the possibility of any advance diversion, it objected to both the recommendations in the Grove Report and most of the recommendations stated above. The reason for its objection was simply that the case had not been made out and the fear of the very great risk which would fall on the Hong Kong Government if the recommendations were accepted.[28]

It should be noted that the Government's traditional approach of placing the risk of uncharted underground utilities on contractors has been criticised by the Audit Commission Hong Kong. The Audit Commission carried out a review on the Construction of the West Kowloon Reclamation Hinterland Drainage Improvement Works, Package 1, developed by the Territory Development Department ("TDD"). It found that diversion of uncharted utilities seriously affected the Contractor's progress of works. The problems mainly stemmed from inaccurate records in respect of the utilities of the site concerned, which were installed many years ago. Considerable delay to the project had been experienced. The Audit Commission considers that TDD could have taken some proactive action and should not have relied solely on the contract provisions concerning the Contractor's obligations to resolve utility diversion problems.[29]

The Audit Commission has also recommended that, for future road and drainage improvement works, especially in old districts where utilities were installed many years ago, the Director of TDD should[30]:

1) critically assess the time required for utility diversion works and allow sufficient time and resources in contracts for such works;

2) specify clearly in the contracts the procedures to be adopted for dealing with unexpected utility diversion works, including an arrangement for sharing the costs of such works between the contractors and the Government; and

3) at the design stage of the works, draw up a realistic programme for utility diversions and seek an in-principle agreement of the utility operators concerned on this programme.

It is quite clear that the above recommendations resemble to a large extent those made by the UWG mentioned ante.

Are the Above Onerous Contract Provisions Indisputable?

What we have seen from the foregoing messages is that it is highly difficult for project owners to change their view to assume the risks of unforeseen ground conditions and the risks of lawful third party interference - underground utilities. This view is strongly hinged on the quest for price certainty that can be obtained at the outset of contract commencement by imposing one-sided risk allocation strategy. As discussed above, this view appears to be incorrect and likely misperceived. Disputes often arise when contractors fail to take into account in their contract price risks that eventually materialise later in the construction stage. Although it is not the ambit of this paper to discuss in detail the legal remedies available to contractors, it is worthwhile to briefly mention the possible arguments a contractor can raise to avoid the strict provisions mentioned above, these arguments are as follows:[31]

1) **Under the Control of Exemption Clauses Ordinance** - where two parties do not have equal bargaining power and where, for example, a major corporation enters into a contract with a consumer for the sale of a product or service on terms which are clearly unfair (for instance, exclusion of liability for negligence or breach of contract), in that situation the court will intervene. However, it is submitted that a construction contract between a major contractor and a government body would not be subject to this legislation. Hence, there is no legislation which specifically prohibits an "unfair" construction contract.

2) **Misrepresentation** - the only statutory remedy which may be available to a contractor is the Misrepresentation Ordinance. If a project owner either innocently or negligently misrepresents the situation regarding ground conditions, the contractor may have a remedy. So for example,

if a project owner carries out a ground investigation prior to entering into the contract and the results of that investigation are passed on to the contractor and those results turn out to be drastically different from the reality there may be a remedy available to the contractor for misrepresentation.

Subject to certain preconditions being fulfilled and proved, the Misrepresentation Ordinance provides that the innocent party is entitled to rescind the contract and/or claim damages as a result of the misrepresentation.

3) **Re-rating of bill of quantities items under Clause 59(4)(b) of the GCCs -** this clause will in certain circumstances provide at least a partial solution to any problems which a contractor faces due to adverse ground conditions. This clause allows a re-rating of any bill of quantities items which are rendered unreasonable or inapplicable as a result of substantial increases or decreases in the quantities of those items.

   If it is assumed that the bill of quantities has been drawn up on the basis of predicted ground conditions, it will often be the case that the quantities for various items either significantly increase or significantly decrease. So, for example, where contrary to predictions, tunnelling in soft ground turns out to be the norm rather than the exception, you would expect to find small quantities for tunnelling in soft ground and large quantities for tunnelling in hard ground. It may be possible to look at the time impact of significant increases or decreases in quantities when looking at not only extensions of time but also new rates for various items.

   The extension of time for completion provisions at GCC Clause 50(1)(b)(v) specifically allow an extension of time where a substantial change in the quantity of any item (not resulting from a variation) takes place.

   It is also quite possible that the contractor will be able to establish an entitlement to his time related costs when new rates are being considered.

4) **Impossibility -** GCC Clause 15 provides that the contractor shall execute the works in strict accordance with the contract save insofar as it is legally or physically impossible to do so. For the contractor to establish that the works are physically impossible to complete it is an extremely onerous task. Unexpected difficulties or expenses are no excuse for non-performance and the contractor cannot in such a case rely upon, for example, adverse sub-soil conditions. He is deemed to have made his own investigations. To succeed in this argument the contractor is specifically required to establish that the execution of the works as designed is physically impossible and not merely difficult or expensive.

Although the above possible arguments do not always provide redress for the contractor, they are sufficient to cause further undesirable delay and additional costs to the project. More importantly, it is crystal clear that a project owner cannot ignore the possibility that he might be one of the ultimate victims of the battle of inequitable risk allocation in construction contracting.

INTERNATIONAL CONTRACT PRACTICE OF RISK ALLOCATION FOR UNFORESEEN GROUND CONDITIONS AND UNDERGROUND UTILITIES

In this section, I intend to cover the international contract practice of risk allocation for unforeseen ground conditions and interference by a third party's underground utilities. After a review of the relevant materials and reports, I have found that only the Grove Report has dealt with both of these in a comprehensive way. I think it is useful to summarise the relevant findings in the Grove Report in a tabulated form, as follows[32]:

	Risks of unforeseen ground conditions		Risks of interference of 3rd Party - underground utilities	
Countries/Types of Contract	Time risks assumed by Employer	Financial risks assumed by Employer	Time risks assumed by Employer	Financial risks assumed by Employer
United States Federal Acquisition Regulation, Title 48, Subpart 52.2, Code of Federal Regulations, Text of Provisions and Clauses (1997) ("FAR")	**Yes**, but subject to reasonable foreseeability test	**Yes**, but subject to reasonable foreseeability test	**Yes** (but not expressly addressed)	**No**
American Institute of Architects, AIA Document A201-1997, General Conditions of Contract for Construction (1997) ("AIA")	**Yes**, but subject to reasonable foreseeability test	**Yes**, but subject to reasonable foreseeability test	**Yes** (but not expressly addressed)	**No**
Europe/United Kingdom International Federation of Consulting Engineers, or FIDIC, Conditions of Contract for Works of Civil Engineering Construction, Part 1, General Conditions, Fourth Edition (1987, reprinted in 1988 and 1992 with amendments) ("FIDIC")	**Yes**, but with certain exceptions and subject to reasonable foreseeability test	**Yes**, but with certain exceptions and subject to reasonable foreseeability test	**Yes**, for deprived possession of site	**Yes**, for deprived possession of site
The Institution of Civil Engineers, The Engineering and Construction Contract, Second Edition (1995, reprinted with corrections, May 1998) ("ECC")	**Yes**, but with certain exceptions and subject to reasonable foreseeability test	**Yes**, but with certain exceptions and subject to reasonable foreseeability test	**Yes**, with exceptions	**Yes**, with exceptions
GC/Works/1 Without Quantities, Contract for Building & Civil Engineering Major Works, General Conditions (1998) ("GC/Works/1")	**Yes**, but subject to reasonable foreseeability test	**Yes**, but subject to reasonable foreseeability test	**Yes**, for deprived possession of site	**Yes**, for deprived possession of site

	Risks of unforeseen ground conditions		Risks of interference of 3rd Party - underground utilities	
Countries/Types of Contract	Time risks assumed by Employer	Financial risks assumed by Employer	Time risks assumed by Employer	Financial risks assumed by Employer
Europe/United Kingdom (Cont'd) JCT Standard Form of Building Contract, Standard Form of Building Contract, Private With Quantities (1980 Edition, incorporating Amendments issued through April, 1998) ("JCT 80"); JCT Standard Form of Building Contract, Standard Form of Building Contract With Contractor's Design (1981 Edition, incorporating Amendments issued through April 1998) ("JCT 81 ")	Indirectly **'yes'**	Indirectly **'yes'**	**Yes,** for deprived possession of site	**Not expressly specified**
Institution of Civil Engineers, Association of Consulting Engineers, and Federation of Civil Engineering Contractors, ICE Conditions of Contract, (Sixth Edition, January 1991; reprinted with amendments, November 1995; reprinted November 1997) ("ICE 6th Edition")	**Yes,** but subject to reasonable foreseeability test	**Yes,** but subject to reasonable foreseeability test	**Yes,** for deprived possession of site	**Yes,** for deprived possession of site
Australia Australian Standard, AS 4000-1997, General Conditions of Contract (1997) ("Australian Standard")	**Yes,** but with certain exceptions and subject to reasonable foreseeability test	**Yes,** but with certain exceptions and subject to reasonable foreseeability test	**It appears so** (but not addressed expressly)	**It appears so** (but not addressed expressly)
Japan Engineering Advancement Association of Japan, ENAA Model Form International Contract for Power Plant Construction (Turnkey Lump sum Basis), Vol. 1, General Conditions (1996) ("ENAA")	**Yes,** but subject to reasonable foreseeability test	**Yes,** but subject to reasonable foreseeability test	**It appears so** (but not addressed expressly)	**No**
Singapore Construction Industry Development Board, Public Sector Standard Conditions of Contract for Construction Works (1995) ("Singapore")	**Yes,** but subject to reasonable foreseeability test	**Yes,** but subject to reasonable foreseeability test	**Yes**	**Yes,** for deprived possession of site

From the above it is observed that international practice usually provides that unforeseen ground conditions allow extension of time and delay cost to the contractor. However, for interference of third party utilities undertakers, there is usually no specific provision to deal with risks of time and money, although force majeure clauses and failure to provide site because a third party is lawfully occupying it, usually allow an extension of time.

Another useful research carried out in 1989 on international practice of dealing with the risk of unforeseen ground conditions shows that in Germany, Switzerland, the Netherlands and Austria, soil risks (i.e. risks of unforeseen ground conditions) are normally assumed by project owners, on a varying degree, while in France, Belgium, Spain and Italy, soil risks are normally borne by contractors although certain contractual redresses are allowed.[33] The issue of whether the contract practice of the latter countries has changed to adopt a more equitable risk allocation model after the formation of the European Union should be subject to a further research. This is however outside the ambit of this paper.

In view of the above research works, it can be said that international practice treats equitably the allocation of risks of unforeseen ground conditions and underground utilities. However, I do not think that this practice works perfectly, nor that it is the panacea for the avoidance of disputes and claims, and hence for the prevention of loss of time and money. Although it seems that at the outset these risks are assumed by project owners, it is the test of 'reasonable foreseeability', being the test to decide whether contractors will get reimbursement of time and/or cost that often creates legal arguments. The resulting reality is that lawsuits will 'dictate' the answer. Max Abrahamson has concisely discussed the problems associated with the application of the reasonable foreseeability test as the final solution[34].

Any Other Better Solutions?

First, I think that the risks of unforeseen ground conditions and underground utilities should be clearly and unequivocally defined in the terms of contract. They should be borne by the party who is in a better position to predict and control them - the one being normally the site owner. Second, the recommendations made by the UWG on underground utilities and those by the Audit Commission to TDD as cited in preceding sections are illuminating - my view is that sufficient subsoil information (both for natural and artificial) should be obtained by the project owner before tendering and this information should be disclosed to tenderers for pricing and project programming purposes. If the actual soil conditions/underground utilities turn out to be different from that provided at the tender stage and which involve more time and costs, the difference should be treated as a variation and the contractor is entitled to time and additional costs.

I think this is in line with the practice of some of the partnering contracts in the world, for example, the C21 Construction Contract in New South Wales, Australia. The philosophy behind this proposition is that "prevention is better than cure". By allowing the contractor sufficient information and time to price for the risks at the very beginning, it is easier to foresee and therefore control, if not reduce, the effect of soil risks impacting upon the construction progress that may arise at a later stage. This can also achieve a greater extent of price certainty than the traditional onerous risk allocation strategy. The only drawback to these suggestions is that the pre-contract period will be substantially lengthened, however this could well be counter-balanced by the benefit of obtaining truly competitive tenders and alleviating disputes and claims.

CONCLUSIONS

The current philosophy of allocating the risks of unforeseen ground conditions and underground utilities in the Hong Kong construction industry can be best described as follows:

"Traditionally the owner and contractor each strive to obtain terms most favourable to themselves. In the heat of negotiations, the parties can easily

overlook an important consideration - the cost of victory. When one party minimises the risk that it retains, the overall project cost is often increased to cover risk financing and/or transfer by an amount greater than is necessary because the risks are not optimally allocated among the parties. This might be called the "legalised gambling" approach to contracting".[35]

Therefore by placing onerous contract terms in construction contracts to shift the risks of unforeseen ground conditions and underground utilities onto contractors, both owners and contractors gamble on the possibility of the realisation of these risks. On the one hand, project owners bet on this practice that price certainty can be best maintained. Many opinions (including mine) are that this is an incorrect perception and ignores the many disputes and claims that involved subsoil ground conditions and underground utilities. On the other hand, especially during an economic down turn, many contractors, if not all, bet that such risks would not be realised and include nothing in their tender price to cover for such risks. Again, when such risks eventually arise, the same result will occur - non-productivity and escalation of costs to both parties.

Therefore, fair and equitable allocation of risks in construction contracts will be the first step to move away from the current unsatisfactory situation. It is true that fairer allocation of these risks does not automatically solve the many problems that Hong Kong has been facing. However, it is one of the major problems that must be dealt with promptly and seriously if one would like to see a better future for our construction industry. It is equally important to note that simply by adopting what international practice is currently using may not be a panacea for the many problems identified above, we therefore should aim for the more innovative ways of dealing with them. Lastly, needless to say, I disagree with the Government's objection to accept the many recommendations made in UWG's report, Audit Commission's Report and the Grove Report as cited in this paper. These recommendations are also echoed in the recent Tang Report. It remains to be seen whether and how the Government will take appropriate action on them!

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A Study of IT Applications Among Quantity Surveying Firms in Hong Kong

Dr. Qiping Shen, Dr. Derek Drew and Jacky Chung

ABSTRACT

This paper introduces the findings of a recent questionnaire survey on information technology (IT) applications among quantity surveying (QS) firms in Hong Kong. The survey was conducted between May and June 2000 among 29 QS firms (80% of the total number of firms) registered in Hong Kong. A total of 15 valid replies were received before the closing date, representing a response rate of 52%. The survey focused on how QS firms use IT in their daily operations, including information flows among business partners, the use of computer hardware and software, IT expenditure and training, management support, the benefits of IT applications, and problems encountered. This study provides an up-to-date and holistic view of the current state of IT applications among QS firms in Hong Kong, including how well they have equipped themselves with IT and their attitude towards adopting and using this technology. Based on the findings, this paper suggests major areas for improving IT usage in this sector of the construction industry.

KEYWORDS: IT Applications; QS Firms; Questionnaire Survey; Hong Kong

INTRODUCTION

Information Technology (IT) is a collective reference to the integration of computing technology and information processing (Long and Long, 1997). Applications of IT in the construction industry have attracted increasing attention worldwide. A number of surveys have been conducted in the construction industry in recent years to investigate the state of the art of IT applications in the industry. These include: a survey of IT trends and needs in the construction industry in the UK (CICA, 1990), the use of IT in construction in Singapore (Betts et al., 1991), IT in construction planning in the UK and the US (Aouad and Price, 1994), data communications in the UK construction industry (O'Brien and Al-Soufi, 1994), priority IT topics that benefit the construction industry in the future (Aouad et al., 1996), and the current situation of IT applications in the Swedish construction sector (Samuelson, 1998).

Although some research work has been undertaken regarding IT applications in Hong Kong (e.g. Shen, 1996; Shen and Fong, 1999), little has been done on a significant scale to investigate IT applications in the quantity surveying (QS) profession in Hong Kong. Some fundamental issues relating to IT applications in the industry have not been fully addressed: for example, what types and sizes of business have used IT, what types of IT have been used and what are their functions, what hardware and software are used, how successfully IT has been implemented, what are the main benefits and difficulties encountered, what are the future prospects for IT in the construction and real estate industry.

This paper introduces the research findings of a recent questionnaire survey on IT applications among quantity surveying (QS) firms in Hong Kong. It provides first-hand information on how well these firms have equipped themselves with IT, which should be useful in the following aspects:

(i) Providing essential data for relevant government departments to prepare strategies for IT application in the construction industry;

(ii) Promoting awareness of the benefits of IT among managers in QS companies in Hong Kong and encouraging them to seriously consider IT in their business; and

(iii) Laying down a good foundation for relevant teaching and further research in the tertiary institutions in Hong Kong.

RESEARCH METHODOLOGY

1 The Questionnaire Survey

The research methodology adopted in this project is a questionnaire survey with pilot tests and clarification by follow-up phone calls after receiving the replies. The pilot work was undertaken in April 2000, with a group of 10 companies participating in this exercise. Based on the results and comments from the pilot tests, revisions were made to the questionnaire design.

The formal survey was conducted between May and June 2000. A total of 29 QS firms were selected as the samples of the survey, representing around 80% of the entire population of QS firms in Hong Kong. A total of 15 valid returns were received by the closing date of the survey, representing a 52% response rate. This rate is much higher than other similar surveys conducted in the construction industry in Hong Kong, and is comparable with international norms.

The questionnaire itself was printed on three pages of A4 paper. A total of 19 multiple-choice questions were asked in the questionnaire. These questions were grouped together into four parts: company information, IT perception, areas of IT usage, and IT implementation.

In order to improve the response rate, a number of measures were taken in addition to the pilot study. For example, a personalised cover letter and a self-addressed stamped envelope were enclosed with each copy of the questionnaire sent out. We also offered free copies of a publication booklet prepared by our research group. As a result, the response rate was much higher than those of similar surveys conducted in Hong Kong, and was comparable with the international norms of similar surveys (e.g. Aouad and Price, 1994; O'Brien and Al-soufi, 1993, 1994).

2 Profile of Sample Companies in the Survey

The profiles of the companies who participated in the survey are summarised in the following three tables (Tables 1, 2 and 3).

Table 1 - Company Size (Employees)

Number of Employees	1-49	50-99	100-149	150-199	≥200	Not Answered
Number of Firms	8	2	0	1	4	0

Table 2 - Total Company Assets (HK$ Million)

Total Assets	≤10	≥10 & ≤100	≥100 & ≤500	≥500 & ≤1000	≥1000	Not Answered
Number of Firms	7	3	1	0	1	3

Table 3 - Years of Existence of the Business (Years)

Years of Existence	≤5	≥5 & ≤10	≥10 & ≤15	≥15 & ≤20	≥20	Not Answered
Number of Firms	0	3	2	2	8	0

As shown in Table 4, among the 15 sample QS firms selected, over 33% of them had more than 10 years' experience of using IT in their daily operations, over 26% of them had 6-10 years of experience, and another 26% had 2-6 years of experience. Only one firm, or 6.7%, had less than 2 years of experience, and one firm did not indicate the years of experience.

Table 4 - Years of Experience in Using IT in Daily Operations

Years of IT Usage	≤2	2-4	4-6	6-8	8-10	≥10	Not answered
Number of Firms	1	2	2	2	2	5	1
% of Respondents	6.7%	13.3%	13.3%	13.3%	13.3%	33.3%	6.7%

FINDINGS OF THE QUESTIONNAIRE SURVEY

1 Perception of IT

We designed the question "To what extent do you agree that IT can help the QS profession?" in order to collect information on QS firms' perception of IT. As shown in Fig. 1, the overwhelming majority of respondents believed that IT could help them in the provision of QS services. Around 93% of them strongly agreed or agreed that IT can reduce the cost of providing QS services, over 87% strongly agreed or agreed that IT can shorten the time required to provide QS services, and 80% strongly agreed or agreed that IT can improve the quality of QS services. Only a small percentage of respondents (around 8-20%) remained neutral. None disagreed or strongly disagreed with the statement.

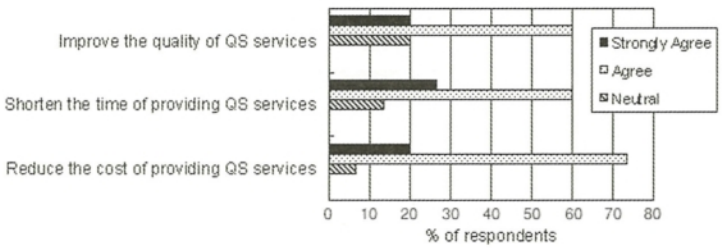

Fig. 1 - Benefits of IT Applications in the Provision of QS Services

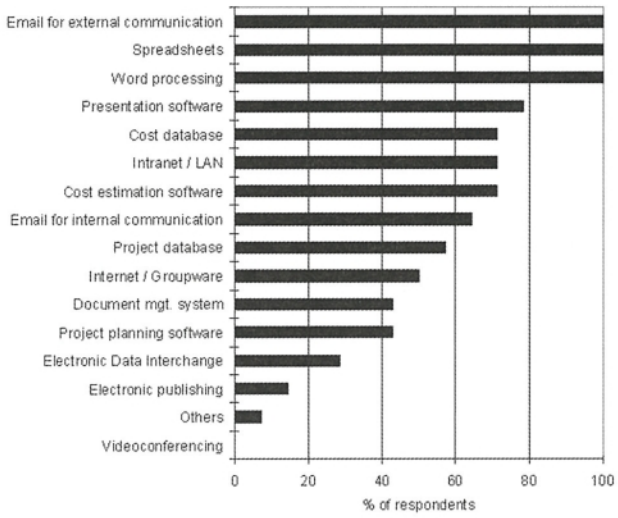

Fig. 2 - IT Applications used in QS Firms

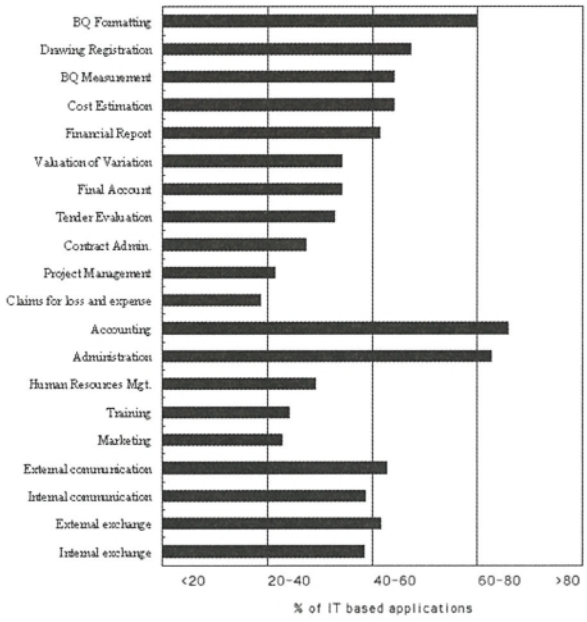

Fig. 3 - Extent of IT used in Operational Tasks

2 Types of IT Applications

Regarding IT applications, we listed 15 types of applications commonly used in QS firms in the questionnaire, and asked the respondents to tick the applications that were used in their companies. As shown in Fig. 2, three out of the 15 items were used by all respondents: they are email for external communication, word processing, and spreadsheets. The remaining types of applications were used by the QS firms to a variety of degrees. The following items had been used by the majority (over 50%) of the respondents: presentation software, cost database, Internet/LAN, cost estimation software, email for internal communication, and project database. Other types of IT applications, such as document management systems and project planning software, were only used by a small number of firms.

3 Tasks Performed by IT Applications

Regarding the tasks where IT is applied, we asked the respondents to indicate to what extent they were using IT to complete a number of QS-specific tasks and general-purpose tasks. For each task, respondents were given five categories to choose from: <20%, 20-40%, 40-60%, 60-80%, and >80%, and these were represented by numerals 1 to 5 in the subsequent calculations of the mean value for each task.

As shown in Fig. 3, in terms of specific QS tasks, BQ formatting, drawing registration, BQ measurement, cost estimation, and financial report were at the top of the list. According to the mean values calculated, IT was used, on average, in around 60-80% of BQ formatting tasks. Around 40-60% of other tasks in the top list were completed with the support of IT applications. In terms of general-purpose tasks, around 60-80% of the accounting and administration tasks had used IT, whereas around 40-60% of the external communication and information exchange tasks had used IT applications.

4 Software Packages Used and Selection Criteria

This section is about the software packages used in major QS tasks and the selection criteria used by the QS firms. As shown in Table 5, Excel is the most widely used software package for almost all tasks, such as cost estimation, BQ measurement, drawing registration, etc. This is followed by Word, which is used frequently in tasks such as BQ formatting, drawing registration, financial reports, final accounts, etc. Among the specialised software packages, BuildSoft and Everest are the second most frequently used packages for cost estimation, and Ripac is the most frequently used package for BQ measurement and the second most frequently used package for tender evaluation. Only a very small percentage (around 10%) of the respondents used them for other routing tasks in the QS firms. A very small number of firms (around 5%) had used other software packages such as Atles in their routing tasks.

Table 5 - The Software Packages Used in QS Tasks (% [ranking])

	Excel	Word	Ripac	BuildSoft	Atles	Everest	Other
Cost Estimation	33.33 [1]	14.29 [4]	4.76 [5]	19.05 [2]	4.76 [5]	19.05 [2]	4.76 [5]
BQ Measurement	25.00 [1]	15.00 [4]	25.00 [1]	10.00 [5]	20.00 [3]	-	5.00 [6]
BQ Formatting	29.41 [1]	23.53 [2]	17.65 [3]	11.76 [4]	11.76 [4]	-	5.88 [6]
Drawing Registration	53.33 [1]	20.00 [2]	6.67 [3]	6.67 [3]	6.67 [3]	-	6.67 [3]
Tender Evaluation	38.10 [1]	38.10 [1]	14.29 [2]	4.76 [3]	-	-	4.76 [3]
Financial Report	52.63 [1]	31.58 [2]	-	5.26 [4]	-	-	10.53 [3]
Interim Payment	42.86 [1]	35.71 [2]	7.14 [3]	7.14 [3]	-	-	7.14 [3]
Final Account	40.00 [1]	35.00 [2]	10.00 [3]	5.00 [4]	5.00 [4]	-	5.00 [4]
Valuation of Variation	47.37 [1]	31.58 [2]	5.26 [3]	5.26 [3]	5.26 [3]	-	5.26 [3]
Claims for Loss/Expense	53.85 [1]	46.15 [2]	-	-	-	-	-
Contract Administration	40.00 [2]	46.67 [1]	-	-	-	-	13.33 [3]

Fig. 4 shows the mean value of the major criteria used by QS firms in software selection. The mean value was calculated by assigning a numeric to each of the five scales: 1 to strongly disagree, 2 to disagree, 3 to neutral, 4 to agree, and 5 to strongly agree. The results show that the most important criteria used by QS firms in selecting computer software were user friendliness, compatibility, and flexibility. Cost came in as the fourth most important factor. Other factors such as past experience, advice from other users, and company policy play minor roles in the process of software selection. This result also shows that QS firms in Hong Kong do not normally rely on consultants' advice to make purchase decisions.

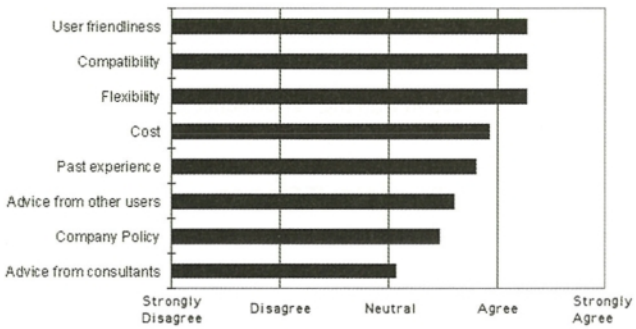

Fig. 4 - The Most Significant Factors in Selecting Computer Software

5 IT Users and Their Satisfaction

Fig. 5 illustrates the frequency of using IT by four categories of employees in QS firms. Whereas over 66% of the senior management (including partners/ directors and associate directors) frequently or always used IT, over 80% of the quantity surveyors were frequent users, around 1/3 of them always used IT. A lower percentage (60%) of the non-technical staff members used IT applications.

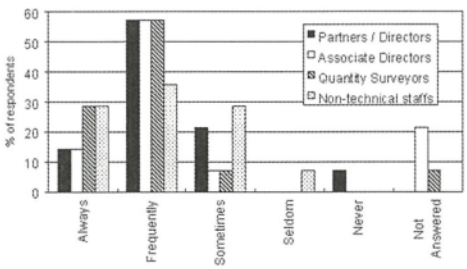

Fig. 5 - Frequency of Using IT by Categories of Staff

Regarding user satisfaction with IT applications, as shown in Fig. 6, over 40% of the respondents were either "extremely satisfied" or "satisfied". However, around 36% remained neutral and around 14% were dissatisfied with the current performance in their companies. This is a good indication of the large room for improvement in IT applications.

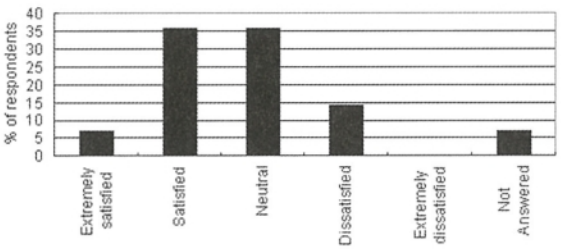

Fig. 6 - Satisfaction with the Performance of the IT Application

6 Corporate IT Strategy and Organisational Structure

Regarding corporate IT strategies adopted in QS firms, 60% of the responded QS firms had an ad-hoc corporate IT strategy, over 33% had IT strategies aligned with their corporate strategies, and only a very small percentage (around 7%) of the respondent firms had IT strategies separate from their corporate strategies.

Regarding organisational structure for implementing IT strategies, over 73% of the respondents said they had IT functional units within their organisations, and the remaining QS firms did not have such an IT unit. Among those companies with IT units, around 50% of them were headed by IT managers; 13% of the units were headed by company directors, and only one company said that the head of the IT unit was a quantity surveyor. In our opinion, companies with separate IT functional units, especially those with functional units responsible to the top management, tend to be more effective in implementing IT strategies within their companies. Based on this analysis, it can be said that top management has provided good support for IT applications in most QS firms in Hong Kong.

7 Investment in IT Applications

Fig. 7 shows QS firms' level of IT expenditure in the last year and forecasted expenditure in the next 5 years. The majority (over 50%) spent less than 2% of their annual revenue, and around 8% of the companies spent between 2-4% of their annual revenue. Around 20% of the companies spent between 4-6% of their annual revenues in IT. A small number (around 16%) spent more than 8% of their annual revenue.

The estimated expenditure for the next five years was mixed among the respondents, but the general trend was that most of them planned to spend a larger percentage of their revenues on IT applications. The percentage of companies that planned to invest less than 2% of their annual revenues dropped to around 20%; at the same time, the percentage of companies that planned to invest 2-4% of their revenues increased to around 27%. It is necessary to point out, however, that because a large number of respondents (around 27%) did not give their estimated IT spending for the next five years, one should not be too optimistic about future IT spending.

One might expect a strong correlation between expenditure and a company's assets. Our results show that there is no such strong correlation between the two variables. The results of a cross-tabulation between company assets and IT expenditure in the last five [KM1] years also revealed that some big companies spent little on IT investment in the past five years, whereas some small companies spent a large percentage of their assets on large IT expenditure.

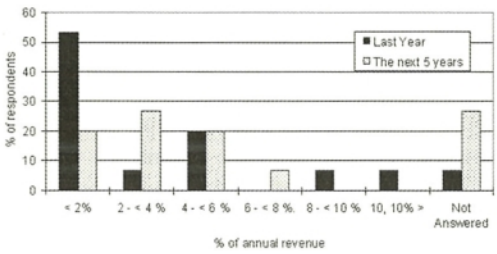

Fig. 7 - IT Investment/Expenditure in QS Firms

Fig. 8 shows areas of intended investment in the next five years. Over 40% of the respondents planned to invest primarily in QS applications, and whereas around 17% chose office applications as their primary area, only 12% chose communication as the primary area of IT investment. Nearly 30% of the respondents did not give their answers to this question. This is possibly an indication of a lack of direction in IT investment.

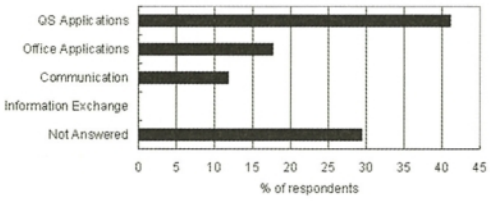

Fig. 8 - Primary Areas of IT Investment in the Next Five [KM2] Years

8 *Problems that inhibit IT Implementation*

The survey also investigated problems that inhibit IT implementation in the QS profession. It discovered a number of problems that prohibit the end users among QS firms from extensive use of IT. As shown in Fig. 9, the top three most significant problems encountered by users are: the high installation cost of software, training problems, and the lack of suitable QS software for the profession. This is followed by lack of experience in IT applications, lack of computer standards for the QS profession, and security problems. Other problems tend to have less impact on the implementation of IT in the QS profession. This calculation is based on the mean values of the answers given by respondents, as described in Section 3.4.

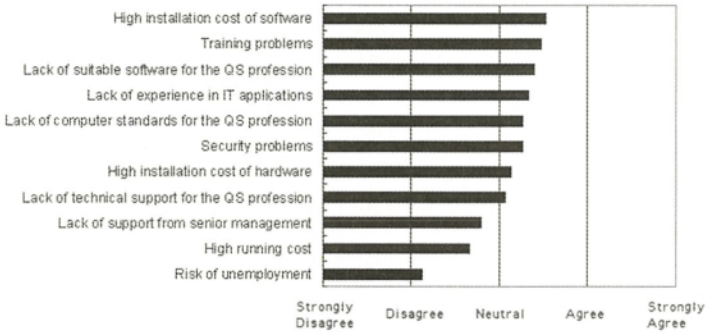

Fig. 9 - Factors that Hinder IT Implementation in the QS Profession

DISCUSSION OF THE FINDINGS

Although response rates for questionnaire surveys are generally low in Hong Kong in comparison with similar surveys in other developed countries, this survey has achieved a very good response rate. This is partially due to the authors' good efforts in ensuring the response rate of this survey. Methods adopted included a personalised cover letter to each QS firm, self-addressed stamped envelopes for convenient replies, follow-up phone calls, reminder letters, and the incentive of receiving a free copy of the research report when available.

The good response rate assures the findings in this survey reflect the real situation of IT applications among QS firms. The responding firms represented the whole spectrum of our population - QS firms in Hong Kong. The findings are also in line with the

general observations of the authors and other research works in the industry (e.g. Futcher, 2000).

Although the overwhelming majority of QS firms believe that IT can help the profession in reducing costs, improving quality, and shortening the time taken to provide QS services, the actual IT applications in the QS firms are very limited. This represents a serious mismatch between the beliefs and behaviours of QS firms in the use of IT in their daily operations. This mismatch can only be solved by changing the attitudes and mindsets of these companies towards IT applications. To overcome this problem, we suggest that QS firms adopt a more positive attitude to using IT, and move away from the traditional "wait and see" approach. The industry as a whole should also take the initiative to promote and improve IT-based applications among all professions within the industry.

The survey revealed that the current use of IT among many QS firms is still at a low level, despite the fact that almost all of them have more than five years' experience in using computers. The predominant use of Excel for QS tasks such as BQ production and measurement is a very good illustration of the problem. Advanced QS packages are not widely used, and there are a number of factors that inhibit the use of these applications.

IT-related training is also inadequate. This problem is probably associated with the high turnover of staff in local QS firms. Because of the high turnover, companies are reluctant to send staff on training courses. This poses a serious threat to the appropriate use of IT in the industry. The top management of QS firms must face these problems and change their attitude to maintain their competitive edge in today's highly competitive environment.

The seriousness of the above problems did not surface in Hong Kong until very recently. Many companies in the Hong Kong construction industry (including QS firms) enjoyed a booming and perhaps the most dynamic economy in the world in the past decade. The recent economic slowdown in the entire region represents a serious challenge to all QS firms. They must do whatever they can to enhance their competitiveness in the market place.

Although it is an established policy of the Hong Kong Government that full advantage should be taken of modern IT (ITSD, 1994), only very recently has attention been paid to the applications of IT in the construction industry. The Chief Executive made a pledge in his 1997 Policy Address to "make Hong Kong a leader, not a follower, in the information world of tomorrow" (Tung, 1997). To realise this vision, the Hong Kong Government in 1998 formulated a comprehensive IT strategy known as the "Digital 21 IT Strategy", which sets out initiatives and a comprehensive agenda for cooperation among the Government, businesses, industry, and academia in promoting IT in the territory (HKSAR Government, 1998). The QS profession should take full advantage of these initiatives and make full exploitation of IT in the industry. Perhaps the professional institution such as The Hong Kong Institute of Surveyors should take the initiative to promote IT applications among the profession.

CONCLUSIONS

This paper illustrates the current state of IT applications among QS firms in Hong Kong. Although IT is regarded as one of the future directions for the QS profession (RICS, 1991), our survey has revealed that the level of IT applications among QS firms in the local industry is relatively low in comparison with other developed countries. This low usage is perhaps related to the conservatism of the industry, whereby a "wait and see" approach is very common. Another possible reason is the relative low labour cost of junior staff in Hong Kong - many companies rely heavily on junior staff to do repetitive work, rather than investing in IT.

The success of IT applications to a large extent relies on the QS profession's attitude and mindset towards IT. The deterioration in the business environment and the rapid development of IT may soon bring

about a significant change in this attitude. Given the increasingly competitive nature of the construction industry in Hong Kong and abroad, QS firms must do whatever they can to make the most out of IT, and to make IT a strategic contributor to the success of their business. This is not simply a matter of the prosperity of the business; it is a matter of survival or the demise of the entire company. Only those who grasp and fully utilise IT applications can survive and prosper in the ever-competitive environment.

ACKNOWLEDGEMENTS

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Fig. 1 - Menu for creating hyperlinks

INTRODUCTION

The topic sounds thrilling and striking, but it is really viable and easy. As most of us can use MS Word proficiently, let us stride over to create our own home pages with MS Word. The only prerequisites are to acquire an MS Word 97 or above version and an Internet browser (e.g. Internet Explorer or Netscape).

For instance, we would like to share the judgements of some recent major court cases and some common legal resources with others via the Internet. Though the contents are directly related to quantity surveying, it serves only as an example to demonstrate the steps for Internet publishing including application for a free web space for uploading and hosting our completed home pages.

PREPARE AN MS WORD DOCUMENT

To start with, we have to design and type the content of our home page in a 'Word' document. We typed the case names of some selected judgements, the institutes and web resources, etc., and saved it as a normal word document file. We also made the home page a little bit more colourful by changing the background to light yellow and using different colours for the headings.

CREATE HYPER LINKS

How to create hyper links for the case names, institutes, and web resources? We have to highlight the area that will bring one directly to the URL address when one clicks. Choose 'Hyper Links' under the 'Insert' menu as shown in Figure 1, then a screen similar to Figure 2 will appear.

Type the URL address we want to bring the user to in the upper box and leave the lower box blank as shown in Figure 2 before clicking the 'Confirm' button. The previously highlighted area will be underlined to indicate that it is hyper-linked. Repeat the above procedures for other court cases, institutes and web resources.

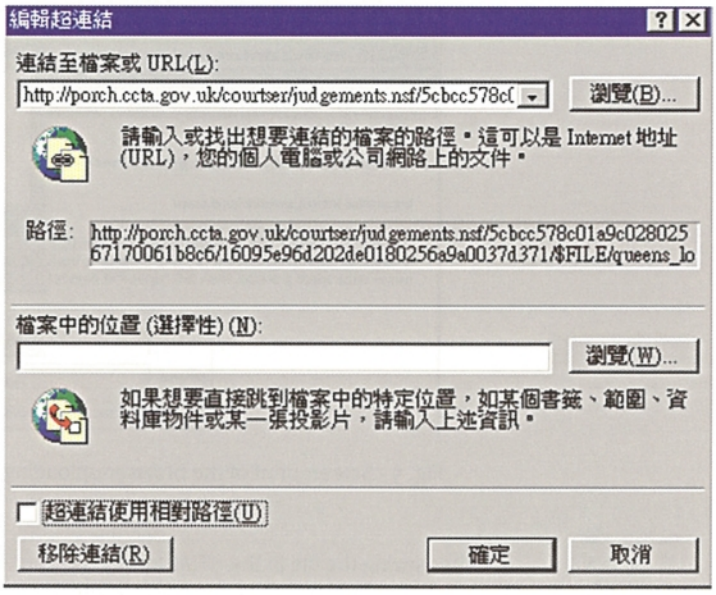

Fig. 2 - Dialogue box for inputting hyper links address

SAVE THE DOCUMENT AS AN HTML FILE

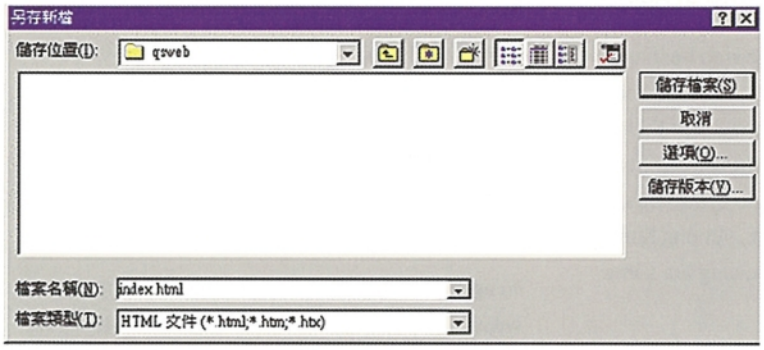

Fig. 3 Dialogue box for saving the word file as HTML file

After inserting all the hyper links, we need to save our file in the HTML (Abbreviation of 'HyperText Markup Language' that can be understood by an Internet browser) format by first choosing 'Save As' under the 'File' Menu. A screen similar to Figure 3 will appear. Type "index" as the file name ('index.html' would be the default page recognised by the web hosting site) and select HTML in the 'Type of File' combo box before clicking the 'Save' button.

Fig. 4 Language coding for transfroming the document (in this case from Word Format) to HTML Format

The computer will ask us the language coding for transforming the file to the HTML format. A screen similar to Figure 4 will appear and the default language coding is US/Western European. However, if our web pages have Chinese characters, we have to choose the 'Traditional Chinese (Big 5)' option before clicking the 'Confirm' button.

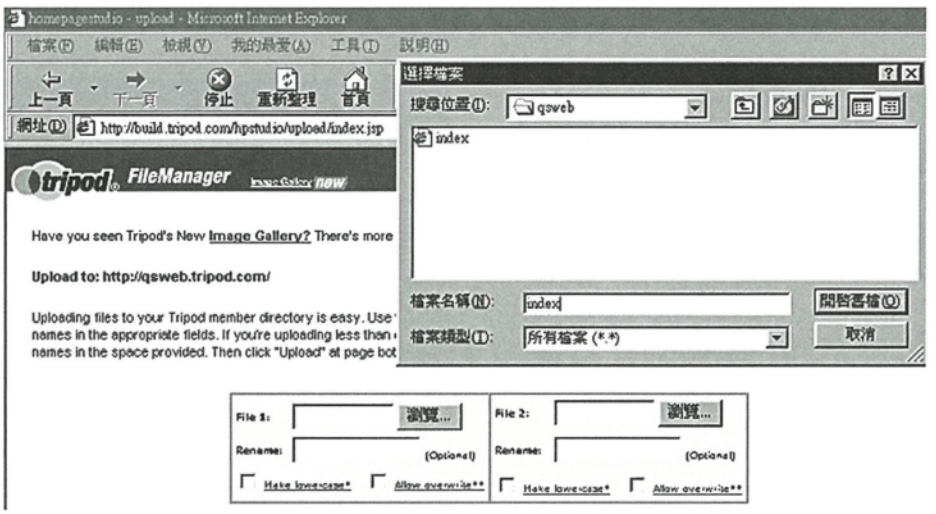

Fig. 5 - Screen-print of the browser-uploading process under the "File Manager" of Tripod

After saving the file in the HTML format, we can preview the home page by opening it with a browser such as Internet Explorer or Netscape.

APPLY FOR A FREE WEB HOSTING SPACE

The next step is to apply for a free web hosting space to where our finished HTML document can be published. Do you wonder how they earn their living? They will put advertisements on our home pages in different forms like banners, pop-ups, frames, watermarks, text links etc. Among hundreds of free web hosting sites, the following are some familiar ones:

http://www.homestead.com

http://geocities.yahoo.com

http://www.tripod.com

http://www.freehomepages.com

http://www.clickherefree.com

The Internet site at http://www.freewebspacereview.net lists 147 (at the time of writing) Internet sites offering free web space services.

Different web hosting sites offer different uploading (the process of publishing completed home pages to the Internet site where everyone can access) methods. We have chosen tripod because its uploading method is very simple and it allots 50 MB (most others offer below 20 MB) free storage to each member.

To apply for a membership, we must visit http://www.tripod.com and click the 'Sign Up' button. We need to type our member name, password, personal information, and the confirmation code before clicking the 'Sign Me Up! >>' button. Our member name is 'qsweb', it should be as easy for our friends to remember as possible, and the URL of our web site would then be http://qsweb.tripod.com ('www.' is not required). It would confirm us if the registration is successful, otherwise it would request us to correct or amend the input data. Upon registration, we can upload our file to it.

UPLOAD THE FILE TO THE WEB SITE

As mentioned before, different web hosting sites entail different uploading methods. Tripod accepts and provides, among other methods, browser-uploading method. It is a straightforward and handy method because it does not call for an extra program.

Visit the Tripod Internet site at http://www.tripod.com and click the 'Log In' button. Enter the member name, 'qsweb' in our case, and password before clicking the 'Log In' button. Then click the 'File Manager' icon and choose the 'single files (8)' option in the 'Upload via' combo box. Browse the location and opt for the name of the file to be uploaded as shown in Figure 5 before clicking the 'Upload' button at the bottom left corner. It permits us to upload a maximum of eight files each time.

After uploading the file into the Internet site, we can visit http://qsweb.tripod.com to verify the outcome. Figure 6 displays the appearance of our completed web site. If it does not show what we expected, we can manipulate (including delete and re-upload) the file by logging in http://www.tripod.com with our member name and password, and using the 'File Manager'. Tripod also provides counters (number of visits), guest books, maps, chat rooms, message boards, etc. for members to append to their home pages. Now we need to tell our friends our web site and its URL address so that they can pay visits to it.

JUDGEMENTS OF RECENT MAJOR COURT CASES

Reasonable time for arbitration
Redland Aggregates Ltd v Shepherd Hill Civil Engineering Ltd (July 1999)
Was cost of credit damage?
Floods of Queensferry Ltd v Shand Construction Ltd (December 1999)
Global cost claims was accepted
How Engineering Services Ltd v Lindner Ceilings Floors Partitions Plc (June 1999)
Who (MC / SC) owns the float?
Ascon Contracting Ltd v Alfred McAlpine Construction Isle of Man Ltd (October 1999)
Employer's administrative cost in DLP
Johnston v W H Brown (June 1999)
Employer's costs for investigating defects not recoverable as damages
Johnston v WH Brown Construction (Dundee) Ltd (April 2000)
Conclusiveness of Final Certificate
Penwith District Council v V P Developments (May 1999)
Right for price adjustment and damages
AMEC Process and Energy Ltd v Stork Engineers and Contractors BV (December 1999)
Exclusion of right to damages by variations clause and bonus agreement for early completion
AMEC Process and Energy Ltd v Stork Engineers and Contractors BV (May 1999)
EOT – Henry Boot Construction (UK) Limited v Malmaison Hotel (Manchester) Limited (July 2000)
EOT and LD - London Borough of Lewisham v Shephard Hill Civil Engineering Limited (July 2001)
Contractor insisted on contract rates
Henry Boot Construction Ltd v Alstom Combined Cycles Ltd (4 April 2000)
Negative rates - Weldon Plant Ltd v The Commission for the New Towns (July 2000)
Design failures are excepted from Final Certificate
London Borough of Barking and Dagenham v Terrapin Construction Ltd (31 July 2000)
EOT for concurrent delay by 'relevant events'
The Royal Brompton Hospital National Health Service Trust v Hammond and Ors (18 December 2000)

INSTITUTES

HKIS | Surveyors Registration Board | Hong Kong International Arbitration Centre
RICS | The Law Society of Hong Kong | The Hong Kong Institute of Arbitrators

WEB RESOURCES

The Hong Kong Lawyer | HKLAWPAGE | Current UK Court Cases
Court Case Database | UK Court Case Database | Australian Court Case Database

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CONCLUSIONS

The above discussion exemplifies a very simple technique for producing and publishing a home page on the Internet site. Users of Word 97 or later versions can do it without using any additional software. However, experts might have come across the FrontPage, which offers more functions and wizards, the JavaScript which provides better control of what they want, and the Flash which offers lively animation. All these may be good topics for discussion in the future.

About the author

I have worked for quantity surveyors consultants, contractors and developers. I currently work in a property development company as a senior quantity surveyor. I have been involved in developing a computer program for estimating, tendering, and post contract administration. My undergraduate and master theses were both directly related to information technology.

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