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Journal Objectives

Unique Attributes

The Journal of Building Surveying aims to publish practical and academic materials for building surveyors, building professionals and all other professionals in the construction industry. All articles submitted for the journal are subject to a refereeing procedure.

Topicality

The Journal is expected to have influential and authoritative voice in the building surveying practice in Hong Kong. It looks at the major issues facing the profession today. Many buildings erected in the last forty years are already displaying various types of defects. The addition and alteration works in buildings presents quite different problems. The works require compliance with current regulations and codes of practices may cause fundamental difficulties in the design. An understanding of fire safety engineering may form part of the knowledge basis of building surveyors in Hong Kong. Materials and their suitability for construction work is another field requiring a degree of expertise. Real estate development will continue be an essential part of Hong Kong building surveyors' duties. Facilities/ property management should be area that needs understanding. These areas and others are expected to be presented in the journal.

Key Benefits

The practical nature of the journal's content means it is a resource for practitioners in the industry wishing to keep abreast of current and international practice, thinking and developments.

Key Journal Audiences

Building surveyors, architects, building services engineers, structural engineers and other professionals in the construction industry.

Coverage

- Building regulations and codes
- Building and construction technology
- Building Maintenance
- Materials, components and building defects
- Real estate development
- Construction management
- Facilities management
- Urban Planning
- Heritage and Conservation
- Education in built environment
- Information technology applied on built environment
- Other areas related to the construction industry

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APPLICATION OF RESONATOR EFFECT IN NOISE REDUCTION OF ACTIVE SILENCERS WITH A PROTECTIVE LAYER

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ABSTRACT

In this paper, the application of resonator effect in noise reduction of the proposed active silencer with a protective layer is studied. The active silencer consists of a microphone (which is used as a sensor), an amplifier and a loudspeaker mounted on the box (which is used as an actuator). The loudspeaker (considered as a membrane mass) and the cavity of the box (considered as an air spring) form an acoustic resonator. The control hardware was setup according to that in reference [Kruger 1997]. The insertion loss performances of the active silencer mounted with different protective layers in the ventilation duct were studied through a series of experiments. The experimental results show that the insertion loss could be up to 11 dB at the resonant frequency of the resonator. It was also found that additional materials were required in the active silencer to improve the degradation of the insertion loss performance caused by the protective layer.

Keywords: Silencer, Resonator, Noise Reduction, Absorption

INTRODUCTION

Similar to those in other cities with high population density, Hong Kong people are living under noise pollution, such as noise generated by vehicles, construction machines, and ventilation systems etc. Thus, the demand in acoustic treatment to create a quiet and calm environment is large. Central air ventilation systems were installed in numerous commercial buildings which generate low to medium frequency noise. Typically, ventilation ducts are designed as compact as possible in Hong Kong such a space-demanding place.

Active silencer is very efficient in low frequency noise control, and it occupies relatively smaller space than other types of silencers. Recently, several research works about the passive silencer, which is backed by an active system, were proposed (Mechel 1989, Lippold 1995, Cremer 1953). Those investigations hinted at problems in the realization of the complex control algorithms. J. Kruger (Kruger 1997, 1996) undertook a series of experiments on the active silencer cassette (ASC) which does not require highly complex digital signal processing but a layer which protects the loudspeaker from the abrasive flow and high temperature. The result showed that the proposed ASC could achieve about 40dB insertion loss at the resonant frequency by installing four ASCs into the ventilation duct. However, the study on the effect of the protective layer on the insertion loss performance was not covered. M. Cuesta (Cuesta and Cobo 2000) proposed to employ a special loudspeaker, which avoids the problems caused by high temperature, in the control system. However, the special loudspeaker is expensive. Another alternative is to use a protective layer (fabric, plastic foils) to replace the expensive loudspeaker, which is conventionally made of thin plastic to minimize the degradation of the acoustic performance of active silencers.

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The objective of this research is to study the insertion loss performances of the proposed silencer with different protective layers. Instead of discussing the theoretical aspects, this paper focuses on the technical and practical aspects in the design of silencers.

PRINCIPAL OF THE ACTIVE SILENCER

The active system in this study was designed similar to the one in reference (Kruger 1997). The system consists of a microphone, which is placed in front of the loudspeaker diaphragm, to measure the sound pressure acting on it. In order to form a single input-single output control loop, the measured microphone voltage is filtered, amplified and fed back to the loudspeaker, and so as to control the loudspeaker diaphragm (see Figure 1). The microphone voltage is proportional to the sound pressure and inverted frequency-independently. Thus, the pressure inside the loudspeaker cabinet increases due to the decrease of the cabinet volume, while the pressure on the surface between the diaphragm and ventilation duct decreases. In other words, the controlled vibration of the loudspeaker diaphragm transforms the sound energy into heat generated through mechanical and electrical losses inside the speaker coil.

Note that the loudspeaker (considered as a membrane mass) and the cavity of the box (considered as an air spring) form an acoustic resonator. Even without any active amplification, a certain amount of insertion loss can be obtained near the resonant frequency of the resonator.

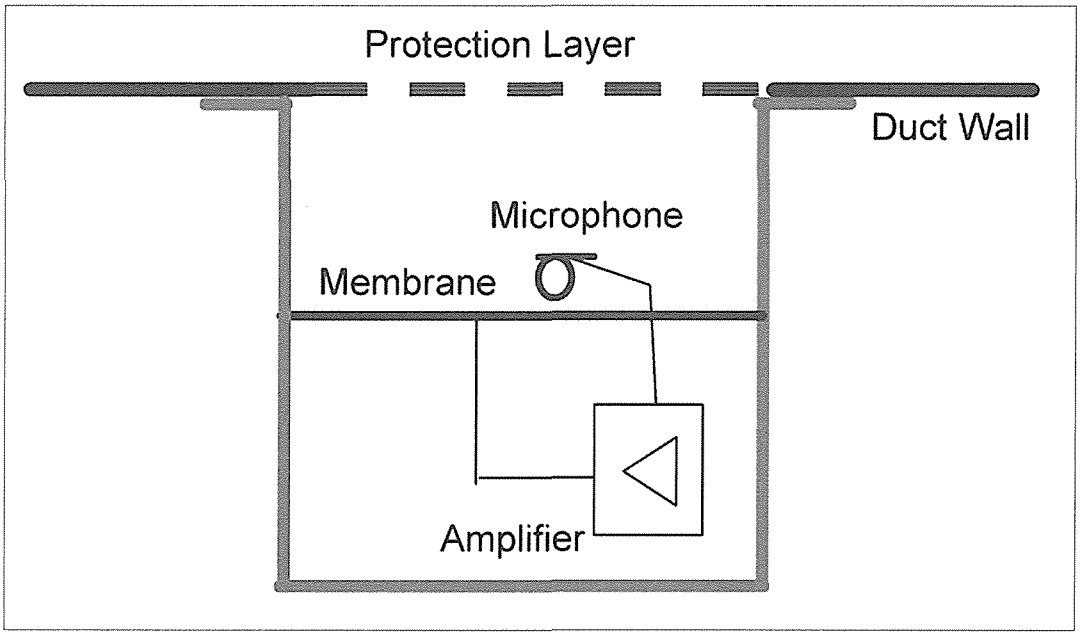

Figure 1: Cross-sectional view of an active silencer cassette

EXPERIMENT SETUP

A horizontal tube of 0.13m in diameter and 4m in length is used in the test (see Figure 2a). The pink noise generator is connected via the power amplifier to the loudspeaker placed at the front of the inlet tube. The microphone placed at the tube is used to measure the internal sound pressure level along the center axis. Absorptive wedges were used as the anechoic termination to eliminate any possible reflective sound waves. The test result is used as a reference in the following experiments to analyze the insertion losses for different configurations of the active control system.

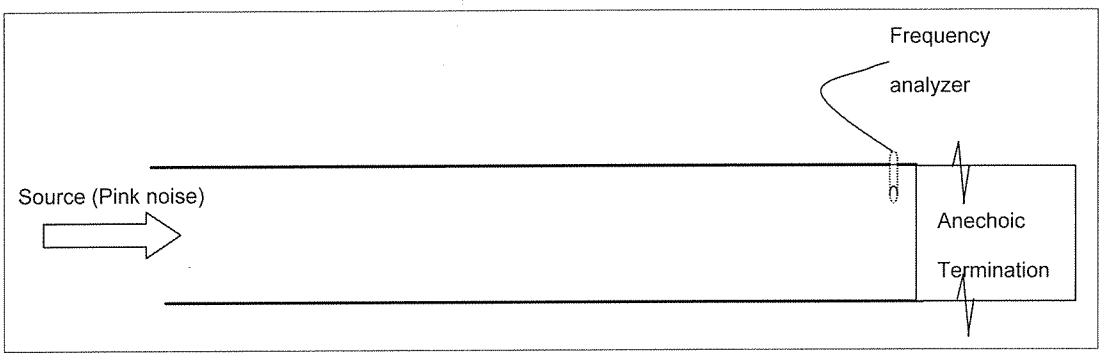

Figure 2a: Configuration of the Horizontal Tube

Only a single input -single output controller is used in the test (see Figure 2b) for simplicity. The following three configurations are considered:

- The active silencer without any protective layer
- The loudspeaker of the active silencer covered by a conventional plastic layer or 0.025mm steel panel or 0.1mm steel panel
- An additional absorption material is placed at the gap between the protective layer and the loudspeaker in the above configuration

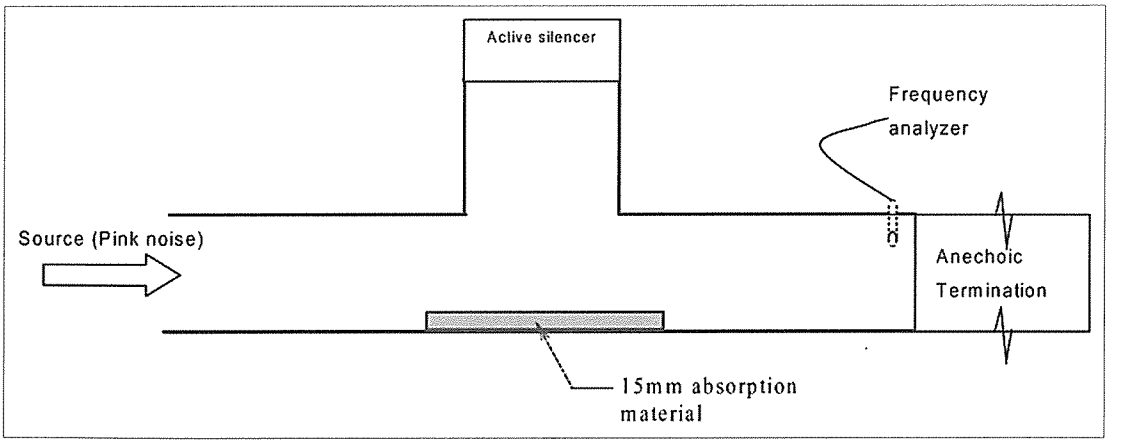

Figure 2b: Active Silencer (without Protection Layer)

RESULTS AND DISCUSSIONS

The insertion loss performances of the active silencer without any protection layer are shown in Figure 3a. For the open loop condition, the two insertion loss peaks are obtained at 125 Hz and 800Hz, respectively. The 3dB insertion loss peak at 125Hz is coursed by the resonator effect of the silencer while the 10dB peak at 800Hz with a narrow effective bandwidth is due to the first cavity mode resonance of the tube. In case of closed loop condition, the silencer can significantly enhance the insertion loss peak performance at 100 Hz up to 11 dB, it also broadens the effective bandwidth. Note that the peak frequency changes from 125Hz to 100Hz in the closed loop condition. The noise reduction at higher frequencies is mainly due to the absorption material placed at another side of the tube.

The insertion losses of the active silencer configured with different protective layers are shown in Figure 3b. The figure shows that all protective layers degrade the insertion loss performances by 3 to 7 dB. The insertion loss peak value at 100Hz of the active silencer covered by the conventional plastic layer is the highest (about 8dB), when compared with the other two cases with the steel panel. The thicker steel panel has a higher degrading effect on the insertion loss performance than the thin one because of smaller panel vibration and sound absorption. In Figures 4a-c, the effect of the additional absorption material with different thickness mounted at the protective layer is illustrated. The absorption materials can improve the insertion loss performance, especially at the peak frequency of 100Hz. Generally, the silencers mounted with thicker absorption material achieve higher insertion loss performance.

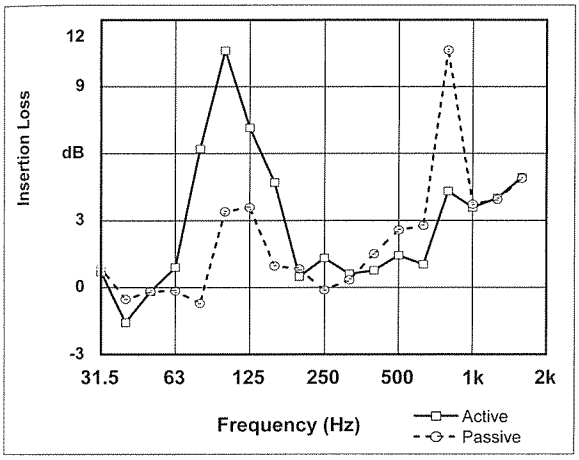

Figure 3a: Performance of active silencer (without protection layer)

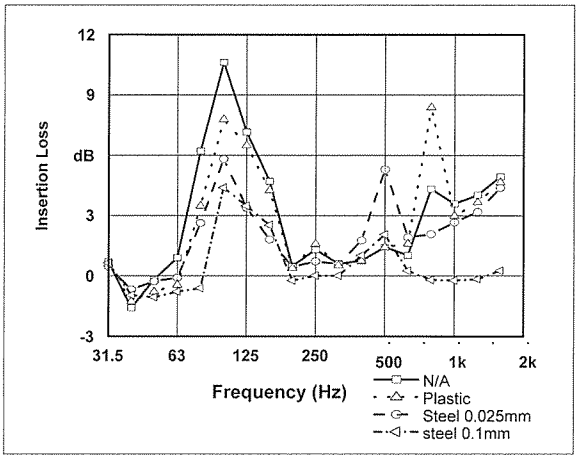

Figure 3b: Active Silencer with different protection layers

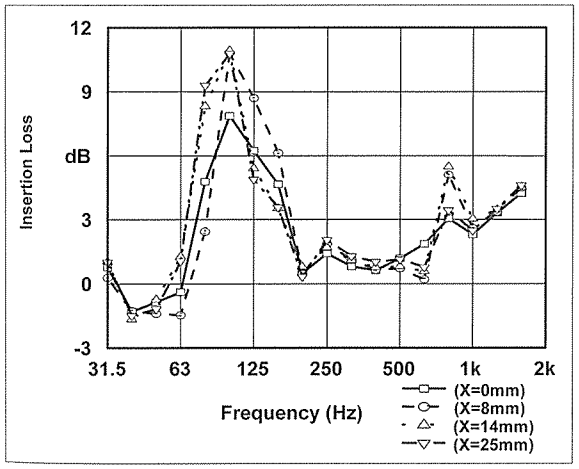

Figure 4a: Plaster layer with absorption material of different thicknesses

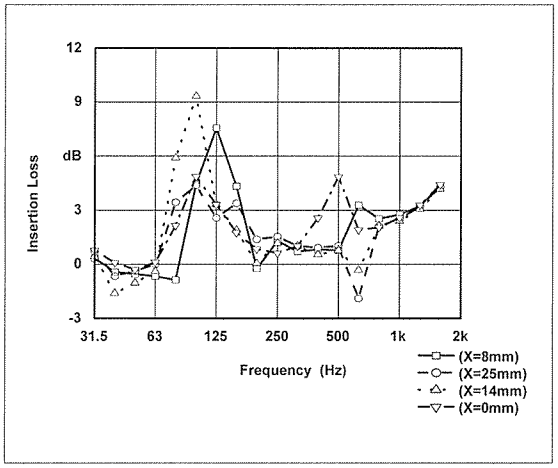

Figure 4b: 0.025mm steel layer with absorption material of different thicknes

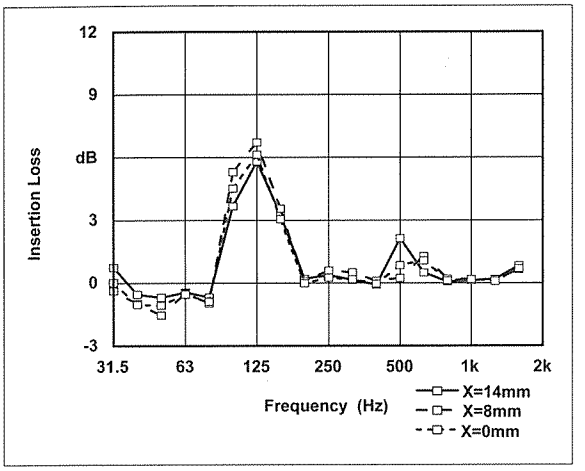

Figure 4c: 0.1mm steel layer with absorption material of different thicknesses

CONCLUSIONS

The application of the resonator effect in noise reduction of the proposed active silencer with a protective layer is studied in this paper. The experimental results show the insertion loss performances of the active silencer mounted with different protective layers in a ventilation duct. The insertion loss could be up to 11 dB at the resonant frequency of the resonator. It was found that additional materials were required in the active silencer to improve the degradation of the insertion loss performance caused by the protective layer.

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CHINA'S ACCESSION TO THE WTO: OPPORTUNITIES OR THREATS TO HONG KONG'S PROFESSIONAL SERVICES SECTOR?

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ABSTRACT

The accession to the World Trade Organization (WTO) by China is very often being viewed as a tremendous benefit to the economy of the Hong Kong Special Administrative Region (SAR); at least according to the official view of the Hong Kong SAR Government. This view is, however, not necessarily shared by critics and particularly practitioners in the professional sector in Hong Kong. This paper examines the real threats and opportunities to Hong Kong's professional services sector following China's entry. The construction and the real estates professional services sector, which building surveying is a major player, is chosen for more detailed analysis given its importance to Hong Kong's economy over the past decades. The strengths and the weaknesses of Hong Kong's construction and real estates professionals when compared to their Mainland's counterparts are studied with a view to recommending improvements and preparations for change. Areas for co-operation and achieving synergy are also explored in the professional services sector in the common interest of China's prosperity.

Keywords: WTO, China, Hong Kong SAR, Professional Services, Building Surveying

INTRODUCTION

"Given our strengths in value-added services, Hong Kong's distributive trades, financial services, insurance, telecommunications, tourism, and many other professional services stand to benefit significantly," said Mr Chau Tak Hay, the Secretary for Trade and Industry of the Hong Kong SAR Government in a statement issued in early 2000 (Global Logistics 2000) on the pending accession of China to the WTO. This seems to be the official view of the Hong Kong SAR Government. This view, though shared by many in the trading and manufacturing sectors, is not necessarily adopted by practitioners in the professional services sectors. Now that China has already gained accession to the WTO for over a year, fears have been expressed that with China inside the WTO, Hong Kong's traditional trade and commercial roles will be challenged. Some also worry that there will be many multinationals bypassing Hong Kong to enter the China's market, and there will be intensifying competition from Hong Kong's neighbouring countries which offer some attractive policies to lure foreign capital. The professional services sector see themselves most vulnerable as the products at stake (the professional know-how and expertise) are most easily replaceable with China's huge learned workforce and ever receding Hong Kong's competitive edge.

Hong Kong needs to examine the real impact of China's entry to the WTO and in particular the General Agreement on Trade in Services (GATS) and the Intellectual Property Rights under the WTO. After about a year of China's accession, it is high time that the opportunities and threats to Hong Kong's professional services sectors be examined closely. It is also important to Hong Kong to fully appreciate its (and Mainland's) weaknesses and strengths and look for opportunities for co-operation and achieving

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synergy to attain the common goal of enhancing Hong Kong and Mainland's prosperity. The construction and the real estates professions, which building surveying is a major player, is chosen for the study in detail as this sector has accounted for the main growth of Hong Kong over the past decades and possibly suffers the most during the recent downturn of Hong Kong's economy.

HONG KONG AND ITS SERVICE INDUSTRY

According to the HKSAR Government's bulletin published as early as 1995, the services sector already accounted for 83.8 per cent of Hong Kong's Gross Domestic Product (GDP) and was substantially higher than the 1985 figure of 69.6 per cent. Even by excluding the public sector, the percentage of share in 1995 was relatively high by reaching 72.8 per cent. In absolute terms, the value-added contribution of the services sector to GDP reached $854 billion in 1995.

In terms of contribution to employment, the services sector is also the principal source of employment. About three out of four employed workers in the labour force are now engaged in the services sector. In general, the rapid growth of the services sector in the past decade has helped to contain unemployment which might even be worse as a result of the structural changes in Hong Kong's economy. Furthermore, the services sector is a major contributor to Hong Kong's external trade balance. For many years, the invisible trade account has been in surplus, offsetting the deficit in the visible trade account. According to the 1996 Annual Report of the World Trade Organization (WTO), Hong Kong is the 9th largest exporter of services in the world. The Government of the Hong Kong SAR considers Hong Kong's excellent professional services underpin the smooth operation of the business sector and Hong Kong's physical development.

Wong (1999) further pointed out that in 1984, the services sector accounted for some 65 per cent of the Hong Kong's economy while in 1999, the figure was almost 85 per cent. In 1981, managers and administrators constituted only 3 per cent of employees in Hong Kong while in 1996, the figure shot up to 12 per cent. Similar to professionals and related workers, the data for 1981 was 6 per cent and shot up to 17 per cent in 1996. This rapid growth is unprecedented anywhere in the world. Over 92 per cent of inbound foreign direct investment to Hong Kong was also in services. The transformation of Hong Kong from manufacturing to services was viewed as an "enclave-like" economy towards a "metropolitan" economy, mainly thanks to the opening up of China and the mass Pearl River Delta (PRD) Hinterland.

An important observation was that while metropolis like New York, London and Tokyo have a cost differential of about 20-30 per cent between the metropolitan and hinterland economies, Hong Kong's differential is about 10:1. This enormous advantage cannot be sustainable particularly with China's entry to the WTO that will remove the real and virtual barrier between Hong Kong and Mainland (currently being insulated by artificial boundary via the Basic Law and entry control). It is common belief that the sustainable growth of Hong Kong as a metropolis will apparently depend on whether Hong Kong can rapidly transform to a knowledge-based economy. The future of Hong Kong's competitiveness will be dependent on whether neighbouring metropolises can overtake Hong Kong's leading edge (notably Shanghai, Guangzhou and possibly Singapore).

THE CONSTRUCTION AND REAL ESTATE SERVICES SECTOR OF HONG KONG

The construction and real estates sector is one of the most important economic sectors of Hong Kong for the past decades. It accounts for about 10 per cent of Hong Kong's GDP. Hong Kong also has one of the world's most active real estate markets (at least up till 1997)

a. Real estate services generating about $100 billion or 9.8 per cent of Hong Kong's GDP and providing jobs for some 74,000 people (1995-96 Figures);

b. A very high rate of property transactions and amongst the highest in the region;

c. A large number of sophisticated registered estate agency companies; and

d. Hong Kong's construction sector professionals including architects, engineers and surveyors being highly skilled and most obtaining world recognized professional standing.

The professional services sector of Hong Kong that had benefited most from the economic transformation over the past decades were, to some extent, protected and insulated from foreign or overseas competition through artificial barrier to professional entrance. As laid down in the Basic Law and according to the principle of "one country, two systems", Hong Kong's professional bodies can enjoy its "independence" for setting standards and entry requirements. Professions like doctors, accountants, engineers and surveyors can set their licensing and registration requirements that can be restrictive. In the construction and real estates sector, for example, ordinances were enacted to register professional architects, surveyors and engineers. Overseas and Mainland professionals were barred from practising unless the professional examinations and local residency and experience requirements have been passed. The "Authorized Person" system (that many Building Surveyors are qualified) under the Buildings Ordinance also restricted the professionals that can be recognizable by the Building Authority for plan submission though the Government Competition Policy Advisory Group did push for widening the entry qualification of the "Authorized Person" (1998 Competition Policy Advisory Group Report).

PROFESSIONAL SERVICES UNDER THE WORLD TRADE ORGANISATION AGREEMENT

Under the WTO Agreement, there are three important annexes (see Fig. 1): the Multilateral Agreements on Trade in Goods (under GATT 1994), the General Agreement on Trade in Services (GATS) and the Agreement on Trade-related Aspects of Intellectual Property Rights, and Trade Agreements that include Government Procurement Agreement (GPA).

As services are of primary importance to modern industrialized economies, the GATS is now of increasing importance and is now overseen by the Council for Trade in Service under the WTO. This is of particular significance for Hong Kong, which is a metropolitan economy where services have already exceeded 80 per cent of GDP. Unlike the trade in goods, the flow of professional services is normally invisible. The barriers to trade in services are usually regulatory inside the border rather than via measures like tariffs and quota.

The GATS under the WTO covers all services, except those provided in the exercise of governmental authority (e.g. the GPA), and seek to ensure transparency in regulations and inquiry points. The GATS seeks to implement the two key basic principles of non-discrimination: most favoured-nation (MFN) and national treatment, which are also the core principles of the GATT. The MFN principle under the GATS allowing exceptions and national treatment applies only to certain sectors that are subject to such limitations as specified in each WTO Member's Schedule of Commitments.

GATS covers four modes of providing an international service

a. Cross border supply of service;

b. Consumption abroad of services;

c. Commercial presence of subsidiaries or branches; and

d. Presence of natural persons in another country to supply a service.

Under the MFN principle, if a country allows foreign services, it must allow equal access to all services and service suppliers of the other Members of the WTO. Under national treatment obligation, foreign and national services and service suppliers must be given equal treatment under the regulations governing applicable service sectors. Under the GATS, there are sections related to each services category such as construction and related engineering services and hence building surveying.

Under the professional services of the GATS of the WTO, provisions for regulations were made initially with accountants and will likely extend to engineers and architects at a later stage. The Council adopted the Disciplines on Domestic Regulation in the accounting sector on 14 December 1998. These Disciplines that apply to all countries with specific commitments to the accounting sector cover the administration of licensing requirements, qualification requirements and procedures, technical standards and transparency requirements. Under the Disciplines, regulatory measures cannot be more trade-restrictive than necessary to attain such legitimate objectives as protecting consumers and ensuring the quality of service and professional competence. These principles are to be integrated into the GATS and become legally binding at the end of the next round of service negotiations. It is highly likely that Hong Kong will be included and eventually to be followed by China after its accession.

AGREEMENT ON GOVERNMENT PROCUREMENT

Another important agreement that will affect the professional services sector under the WTO is the GPA that is under Annex 4 (see Figure 1). The worldwide market for government procurement accounts for trillions of dollars in commercial transactions each year, including commercially significant purchases of

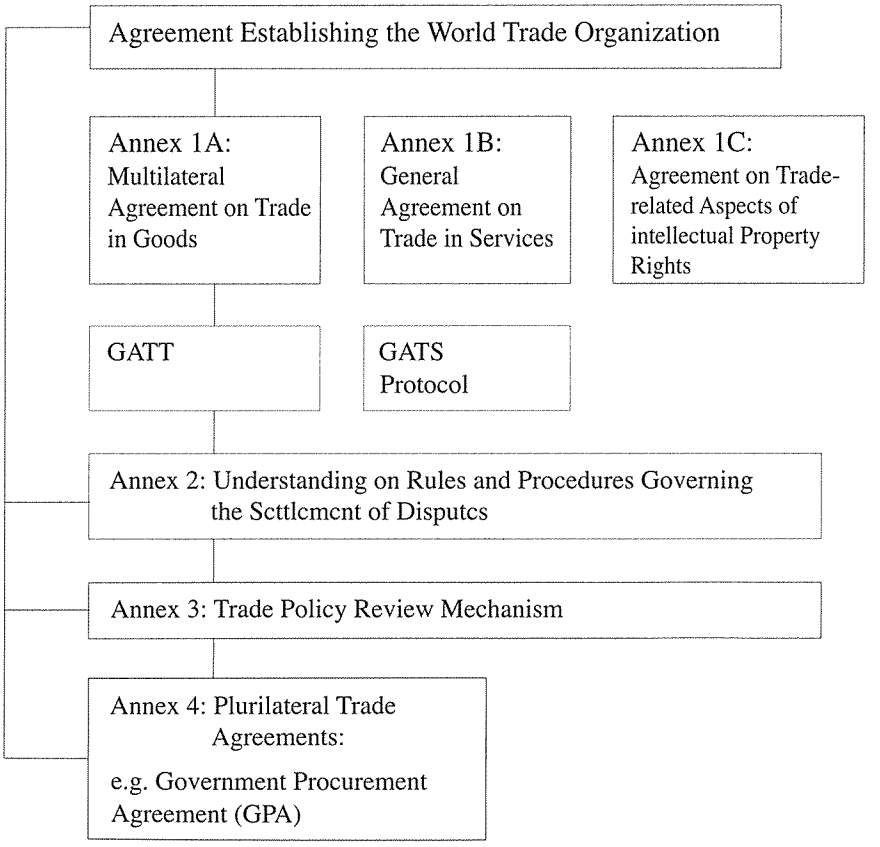

Figure 1: Legal Structure of the Marrakesh Agreement Establishing the World Trade Organization (WTO)

telecommunications networks, electrical power grids and transportation systems. The WTO's GPA requires government agencies to follow non-discriminatory, open and transparent procedures for government procurement. It covers procurements of both goods and services, including construction, and applies to purchases by central and sub-central government agencies as well as government-owned enterprises.

According to the Hong Kong SAR Government's statement dated 19 June 1997, "Currently, only 23 of the WTO's 131 Members are signatories to the Agreement. Hong Kong is the first new signatory to join the Agreement since its entry into force in 1996." With China's accession to the WTO, Chinese signatory is a matter of time.

In the construction sector, government procurement is of importance and will likely affect professional services architecture and engineering. The HKSAR Government is the most important agency in procuring infrastructure professional services. Other non-government organisations (NGO) like the Housing Authority, the Mass Transit Railway Corporation, the Kowloon-Canton Railway Corporation and the Hospital Authority all play a part in procuring mega-projects and have wide implications for the architectural, engineering and surveying professions. In essence, mainland professional services sector is eligible to compete for major infra-structure projects in Hong Kong if China joins the GPA.

COMPARATIVE ADVANTAGES OF THE PROFESSIONAL SERVICES SECTOR: HONG KONG AND MAINLAND COMPARED

Hong Kong companies currently are subject to the same restrictions as foreign corporations in China. This implies greater competition by large multinationals for Hong Kong's relatively small service providers, along with a flight of manufacturing to lower-cost Chinese factories. The local Hong Kong services industry, which is currently relatively open, will increasingly be open to Mainland companies.

In the services sector, human resources and know-how are of prime importance. Many commentators have worried about the deteriorating output from Hong Kong's universities (though three of the Hong Kong's top universities are still within the top ten of Asian universities according to recent polls). China, on the other hand, is described as producing quality graduates with highly competitive learning attitude and outlook together with superior language capability (at least in written and spoken Chinese for the top universities). Recent studies also indicated that mainland students from major cities have overtaken Hong Kong in terms of mathematics, science and language ability. According to the 1998 China Population Statistics, the percentages of town illiterate and semi-literate were 3.79 for male, 13.22 for female and 8.58 for total. Hong Kong has a much higher rate of literacy but apparently China is fast improving particularly for cities like Shanghai, Beijing and Guangzhou. The more important issue is the disproportionate total number of qualified graduates produced in Mainland when compared to Hong Kong. Without an artificial barrier and with added mobility provided by the WTO, the influx of well-qualified professionals to the professional service sector can be significant.

Another important factor in professional services competitiveness is the ability to retain high quality professionals and firms. Quality of life and physical environment to retain also play a part. The highly mobile, knowledge-intensive workforce will flock to location that produces the best. Hong Kong is probably on the down-hill while cities in China like Beijing, Shanghai and even nearby Shenzhen Special Economic Zone are all improving their attractiveness.

Hong Kong is worst in its high cost both in terms of staffing and expenses. Median cash compensation of Hong Kong's senior executives is in the range of $1 million to $1.6 million per annum plus benefits (Wyatt 2000). Property cost is still unreasonably expensive despite the recent downturn. Wong (1999) did point out that the cost of "trade"and "non-trade"goods need to be distinguished. "In the traded sector

our cost structure cannot be too high ... but this is not the case in the non-traded sector ... The real policy is not about lowering costs and prices across the board, but in making the non-traded sector more competitive in a global environment." He further pointed out that wages and prices of the professional and technical services must not be so high as to price itself out of global market place. More importantly, this would entail reducing artificial barriers to entry and making it more tradable in the world market. Exposing the traditionally insulated professional services sector is a fundamental policy change that may need to be initiated by the Government or forced upon Hong Kong via the WTO agreement.

In terms of self-regulation and licensing, Hong Kong does have an elaborate and sophisticated licensing system very much borrowed from the British system to ensure quality professional services. Mainland is fast following with new legislation and licensing control of its professional services sector and some will likely obtain international recognition in the near future (e.g. surveyors).

In terms of communication, Hong Kong still has the competitive edge with its very high wide-band coverage and sophisticated international connection. In Research and Development, Hong Kong is certainly lagging behind. Recent reports already indicated that China is only behind the United States and Japan in refereed journal publications.

HONG KONG GOVERNMENT'S STAND AND POLICY

As already pointed out, the Hong Kong SAR Government's stand on China's accession to the WTO is one of optimism and benefit to Hong Kong's economy. In his speech to the Asia Society in April 2000, Hong Kong's Chief Executive, Mr Tung Chee Hwa, stated that, "One of the greatest advantages in developing Hong Kong into a world class city is our links with the Mainland China. Over the past 20 years, Hong Kong has benefited greatly from China's open door policy. With China's accession to the WTO, Hong Kong stands to gain greatly. Inward investment into China will also make quantum leap. As one of the major conduits in these areas, Hong Kong stands to benefit."

Tung (2000) further pointed out that "China's accession is not simply about business opportunities. It is also about strengthening economic stability in the region. ... It is about developing the global economy on responsible, rules-based principles."

THE REALITIES

Beech (1999) pointed out that, "the People's Republic's accession into the World Trade Organization may make Hong Kong's lucrative role obsolete (!). As Beijing is forced to open up its markets and adhere to international trading standards, foreign investors who once stopped off in the former British colony for advice and financing may find it easier just to head straight to the mainland....Within a few years, as China is forced by the WTO agreement to liberalize its markets, Hong Kong could be out of a job."

Many have also predicted that though there may be a lot of expertise in Hong Kong, the westerners are increasingly going to bypass Hong Kong. Taiwan's entry into the WTO can even worsen the situation. So far, domestic regulations have kept Taiwan from directly investing in the Mainland, so many of the island's businesses have instead funnelled money through Hong Kong. It is likely that through the WTO membership, Taiwanese merchants no longer have to play these elaborate "money games" and thus to leave Hong Kong out of the equation.

Shek (1999), on the other hand, remained optimistic provided Hong Kong is fully prepared for the change and embraces China's accession. According to Shek, "The new economic order would bring in new challenges, problems as well as opportunities. Hong Kong stands to benefit from the development, in particularly in the services sector. ... There is an urgent demand on professional expertise related to

quality management systems and training, industrial and marketing strategies but the market does not seem mature enough to be able to afford or prepare to pay for the high consultancy services fee."

The key seems to be preparedness and capability of Hong Kong to provide value-added service for the Mainland.

PREPARING FOR THE WORST

If Hong Kong is to retain its position as the gateway to China's market, it will need to "re-position" itself. Not only will Hong Kong businesses have to take greater advantage of their cultural and linguistic ties to the Mainland, they also need to shift their focus from being middlemen to becoming direct market investors. This is equally true for the professional services sector.

Having realized Hong Kong's competitive "disadvantages", Hong Kong professional services sector probably needs to carry out measures to improve on its weaknesses and enhance its strengths:

Improving its "learned workforce" and retraining

The emphasis is to be on life-time learning for all and retraining the unskilled labour to enter the learned workforce in short to medium term.

Reviewing immigration policy

The major pool of highly skilled and highly competitive learned professional workforce is just on the other side of the border and they should be encouraged to settle and assimilate into Hong Kong's society in a well-controlled manner.

Exploring the regional and global markets

China has been the "easy" market for Hong Kong over the past decade. It is about time that Hong Kong professional service sector sought for opportunities in the regional and even global markets. This can be in the construction and the real estates sectors.

Synergizing current competitive advantages

Chan (1998) pointed out that Hong Kong's competitive edge had been its financial and real estates sectors and the two should be synergized to explore external markets. Similarly, the Mainland and Hong Kong professional services should also be able to co-operate and synergize their mutual competitiveness for export.

Realizing the eventual loss of protection

Hong Kong is subject to China's "one country, two systems" policy, which aims at taking advantage of Hong Kong's business and technical expertise while maintaining political control over the former British colony. The WTO, to some extent, will water down the protection to Hong Kong's professional services sector. Complacency is the worst enemy and the realization of difficulties ahead is the best protection for the professional services sector.

CONCLUSION

The GATS and the GPA Agreements do not seem to come about immediately with China's accession to the WTO. Further research on the actual impact on Hong Kong's professional services sector is also needed after the initial period of China's WTO accession. However, it will be a matter of few years before full implementation of the WTO Agreement that will incorporate the GATS and the GPA. The "one country, two systems" principle and the legalistic implication for professional services barrier between

the Mainland and the Hong Kong SAR will be under test. Direct competition among professionals and professional firms (e.g. architectural and engineering) are apparently very real threats that can be expected within the coming years.

Some may view this as an opportunity rather than threat. Instead of competition, the Mainland market is so vast and the potential benefit is so great that all professional services can be rewarded and the fittest will take the largest share. Furthermore, there are ample opportunities for the Mainland and Hong Kong professionals to synergize their respective competitive edge for exporting their service to the region and the world. The outlook is hence much brighter than viewed by the pessimists.

Nevertheless, Hong Kong as a metropolis and a discrete economic entity needs to prepare for the worst despite hoping for the best. The most important issue, apparently, is to enhance Hong Kong's strength. Hong Kong's strength in the construction and the real estates sectors together with the financial sector provide good opportunity for synergizing the two for sustainable growth of Hong Kong's economy (Chan 1998). The Hong Kong SAR Government has the policy dilemma of opening up the professional services sector for improving competitiveness while not hurting the local professions. May be it is also high time that instead of engaging in competition, the Hong Kong Government took a lead to promote cross-border co-operation for professional services export in the regional and global arena. The Hong Kong building surveyor, as one of the major players of the construction and the real estate sectors in Hong Kong and the Mainland does need to re-position itself under this mega-trend.

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HOUSING DILAPIDATION IN HONG KONG: A CONCERN ON BUILDING QUALITY

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ABSTRACT

An exacerbating problem of dilapidation in Hong Kong is envisaged owing to the building boom in the 1960s. The construction quality of this vintage has a far-reaching effect on the overall rate of deterioration of the whole city. This paper firstly reviews the previous technical studies on the building quality of different vintages. It shows that 1950's and 1960's vintages are exceptionally poor in terms of building quality. Casual observation also manifests the excessive rates of depreciation in the 1950's and 1960's vintages.

Keywords: Vintage, durability of building, deterioration and maintenance

INTRODUCTION

The building boom in the 1960's has resulted in a sudden upsurge of the proportion of ageing houses in the age group of 30s today. The dominance of this age group and the construction quality of this group of houses has a far-reaching implication on the dilapidation problem as it will greatly affect the overall rate of deterioration and obsolescence.

The poor quality of houses does not only reduce the durability of the materials, but it also deters the owners from investing maintenance on the houses. As a result, it would greatly exacerbate the rate of depreciation for a vintage with poorer quality. In this paper, the studies on the building quality of different vintages will be reviewed and a casual observation on the rates of depreciation for different vintages is to be presented.

Section 2 reviews the previous technical studies on the building quality of different vintages. The quality problem in public housing is also reviewed. Section 3 puts forward Parks' (1979) model to exposit the impact the durability on the rate of deterioration. Then a casual observation on the rate of depreciation of different vintages would be presented.

BUILDING QUALITY OF DIFFERENT VINTAGES

The construction quality of post war houses can be reflected by the results of the series of large-scale building surveys carried out by the Building Authority. The latest cycle of inspection can be traced back to the late 1980's when the general building condition had deteriorated to a level of crisis. A large sample of private buildings (22,500 blocks which accounted for about 41% of total stock) was inspected and the report was completed in early 1990. It was found that 8,000 (35%) buildings were in poor state of repair, 7 blocks have had to be closed and 67 blocks were in dangerous state. The remaining 14,000 buildings would not require major repairs within 5 years.[1] In the wake of the alarming result, a complete survey of the whole population of private building stocks was carried out. Then in late 1990, the Building Authority acknowledged that almost 17,000 (31%) buildings in Hong Kong were suspicious in structural condition (out of the 55,000 private building stocks in total), while another 193 (0.35%) were dangerous requiring urgent attention.[2] The buildings were sub-divided into three categories as shown in Table 1 according to the remedial action required.

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[1] Blelengberg (1990) reported the findings of the Building Authority
[2] Stoner (1990) and Hughes (1991) reported the findings of the Building Authority

Category	No. of Buildings	Conditions
Top Priority	210 (0.35%)	Immediate danger of collapse, require remedial action
Category II	17,000 (31%)	Suspected to be dangerous which require detailed structural examination
Low Priority	38,000 (69%)	Do not require major remedial action within 5 years

Source: Leung.J. (1992)

Table 1: Private building's conditions in Hong Kong, 1992

Buildings Department completed the survey of the category II (16,700) private buildings in 1996 and 6,187 (37%) statutory orders were served, requiring certain buildings to be repaired or demolished. However the condition of building dilapidation did not seem to be improved. In the wake of the collapse of a balcony at Bowring Street in 1993, a consultant was appointed by the Building Authority to conduct a condition survey of 4,308 privately owned post war (built in 1946-1958) buildings with cantilevered elements. The report [3] was completed in 1995 and the findings raised the concern on the durability of the buildings in this age group.

Premises built in 1946 - 1958

Firstly, the buildings of this group are inherently inferior because of the less stringent statutory requirements and technical know-how at that time. [4] Worse still, they were regarded as even poorer than that built in the 40s because of inferior workmanship associated with the pace of development. For example, the consultant carried out detailed investigation on four buildings on the age group and found that *reinforcement corrosion was actively occurring and was a significant concern. At most locations examined, concrete was of poor quality and in low compressive strength.* [5] *The steel reinforcement occupied concrete was carbonated and chloride contaminated.* [6] *Section loss on stirrups often exceeded 25% and in some cases exceeded 50%. In almost all cases the depth of carbonation exceeded the depth of concrete cover to the steel by a considerable margin implying that the steel may have been actively corroding for more than 30 years in some cases.*

The alarming condition did not wait for our manoeuvring of action, another balcony at Marble Road, which fell in the category of 1946-1958, was collapsed in 1997. It was caused by, inter alia, over-stressing of the steel bars due to additional loading and misplacement of bars; corrosion of steel bars together with concrete strength 30% below the original design requirement. A special task force was set up to investigate the structural condition of 645 reinforced concrete cantilevered balcony structures in this age group. The public wailed with grief when the results publicised in 1998 (Table 2).

Type	Numbers	Conditions
Balcony built in 1946-1958	114 (18%)	Reinforcement showed different extent of rusting and damage which require detailed structural examination
	531 (82%)	Do not require major remedial action within 5 years

Source: Buildings Department's press conference reported by Ming Pao (12/12/1998)

Table 2: Balconies conditions in Private Buildings, 1998

[3] Buildings Department (1995)

[4] Most of the 1946-1958 age group buildings were designed to either the 1915 or 1938 reviews of the London County Council By-Laws. Not only is the required concrete strength much lower, but the elements designed to the previous codes also have inherently lower safety margins in shear than that of the current code. The report figured out that it was very common to find elements designed to these old codes had lower capacity in shear.

[5] The mean compressive strength approximated 11MPa with a standard deviation of 3MPa. Although it is far lower than would be expected today, the results were not far from the strength required by the original design standard (about 12.5MPa)

[6] Chloride ion concentration was typically three times the corrosion threshold of 0.4% chloride ion by weight of cement.

Premises built in 1959 - 1980

It is a common belief that dilapidation is merely the consequence of deterioration, which is age-specific. The poor condition of the age group 1946-1958 is simply because they are old, and the problem will soon be eradicated through re-development. Yet, vintage (cohort) effect on building durability should not be neglected. For example, it is well known that during the period of 1964-1965, the severe weather had resulted in a harsh construction environment. The Government recorded as follows:

'In 1964, ... the year has been notable for a very long dry spell of weather, which produced a draught of exceptional severity. Work requiring the use of clean water, such as concreting, plastering and rendering has been held up.' [7]

'In 1965, a record number of typhoons and tropical storms and shortages of granite aggregate was encountered.' [8]

However, the supply quantity reached an unprecedented peak in these years because of, inter alia, the amendment of Buildings Ordinance. In the light of the provisions of the Building (Planning) (Amendment) (No. 2) Regulation 1962, the intensity of development would be more restrictedly controlled [9]. It triggered a rush of development plans submissions from private developers as recorded in Hong Kong Annual Report 1964:

'Private developers initiated a phenomenal number of schemes with intensities of development which new legislation was about to restrict: as a result the value of completed buildings in 1964 reached the unprecedented figure of $838.4 million in spite of unusually bad summer weather.' [10]

The investigation on public rental housing carried out by the Housing Department in 1986 reinforced the above postulation of vintage effect (see section 2.3), but there was no similar survey on private housing, until the collapses of canopy in 1994 and 1997. The report [11] on the collapse of canopy at Aberdeen in 1994 revealed that besides the unauthorised use and alteration of the canopy, the position and spacing of reinforcement was one of the causes of the accident. The building was completed in 1973 and it raised the concern on the safety of canopy and the construction quality of buildings of the age group 1959-1980. The Authority therefore conducted a systematic investigation programme on 981 reinforced concrete cantilevered slab canopies. The results showed that more than 10% of these canopies were dangerous and about 50% were found to have different extent of rusting of reinforcing bars, incorrect position of reinforcement, overloading and/or over thick of concrete (Table 3).

Type	*Numbers*	*Conditions*
Cantilevered Canopy	100 (10%)	Immediate danger of collapse, require remedial action
	476 (49%)	Suspected to be dangerous which require detailed structural examination
	405 (41%)	Do not require major remedial action within 5 years

Source: Buildings Department's press conference reported by Ming Pao (12/12/1998)

Table 3: Canopies conditions in Private Buildings, 1998

[7] Government Information Services (1964)

[8] Government Information Services (1965)

[9] Before the amendment, the intensity of development was controlled by means of the volume of a building calculated on street width and permissible wall heights. But under the provisions of the amendment, the intensity of development is controlled by the use of plot ratio and site coverage. The amendment was passed in 1962, but it will not be fully operative until Jan 1966. Certain relaxation of time limits was allowed later in the wake of building bust since 1965.

[10] Government Information Services (1964)

[11] Buildings Department (1994)

Another canopy collapse at Kwun Tong happened in 1997, the building was also completed in 1972. The report [12] identified that the collapse mode of the canopy was failure in bending which was caused by, inter alia, the incorrect position of steel reinforcing bars during construction. In fact, the problem of misplacement of steel bars was a common cause of the collapses. The same consultant was appointed to carry out a condition survey of buildings constructed between 1959 and 1980 and the cantilevered canopies in this age group to establish their deterioration trend. The report has not yet been publicised though, it was disclosed that the vintages of 60s showed the poorest building conditions [13], which concurred with the findings in public rental housing and supported the postulation of vintage effect.

Durability of Public Rental Housing

The construction quality problem in public rental housing was firstly unveiled by the failure of a ceiling in Kwai Fong Estate in April 1980. The estate was built in 1971-1973 but numerous occasional spalling repairs were recorded in the first few years. When an extensive spalling repair was proceeding in 1980, a small portion of ceiling collapsed and it triggered a concrete coring programme on all public housing over 5 years old. The tenants were distraught with worry on the results as it showed that 49.6% of the core strength were below specification. Most of the below-specification cores were come from the houses built before 1974 (Table 4). The report [14] concluded that 26 blocks of them were beyond repair and had to be demolished. Furthermore, a resolution was passed in 1987 in Housing Authority that all public rental housing constructed before 1972 had to be demolished. [15]

Age group	*% of the sample fell into the category of Core Strength (MPa) of walls (specified strength = 20)*		
	< 10	10-20	>20
Pre 1960	0%	46.5%	53.5%
1960-1964	0%	49.4%	50.6%
1965-1969	0.5%	69.7%	29.8%
1970-1974	11.6%	69.4%	19.0%
1975-1979	0%	8.7%	91.3%
1980-1982	0%	2.0%	98.0%
Post 1982	0%	0%	100%
Total %	**1.8%**	**47.8%**	**50.4%**

Source: Housing Department (1986b)

Table 4 : The Results of Core Strength in Public Rental Housing, 1986

The large-scale re-development scheme does not provide a sigh of relief. Another spate of construction quality problem emerged during the building boom around 1997. Four of the most eminent incidents was the excessive uneven foundation settlements in Tin Chung Court, Tin Shui Wai, the piling problems at Shatin Area 14B Phase 2 (Yuen Chau Kok), suspected use of rejected substandard construction reinforcement in Tung Chung Area 30 Phase 3, and the suspected use of substandard construction materials in the Redevelopment of Shek Yam Estate. The Yuen Chau Kok case has once again resulted in the complete demolition of the two blocks of buildings which cost over HK$0.6 billion [16]. The precedent Director of Housing Authority attributed the quality problem to, inter alia, the boom of construction and uneven distribution of workload, an unprecedented high level of housing production up to 90,000 units in 2000/01 was completed. [17]

[12] Buildings Department (1998a)
[13] Taywood Engineering Ltd (2000)
[14] Housing Department (1986b)

Similarly, the phenomenon of poor construction quality, such as the deficiencies to piling works was also commonly shared in both private and public sector. [18] Although one of the accused contractors pleaded guilty and was fined with the maximum imposed. [19] Preventive measures [20] have also been implemented since 2000. Whether there will be any vintage problem under this cohort requires decades to reveal as Bates (1996) said *'there was a need to produce homes for people fast, but the failure to address quality was to impact with vengeance decades later'*.

Technical Specifications and Reparability

It is commonly conceived that the dilapidation of buildings is attributable to the lack of maintenance and repair. Investigation or repair orders are normally served [21] to the landlords owning the defected elements. However, the consultant's report [22], raised the concern on the reparability or the effectiveness of repair on buildings with low level of durability. It noted that up to 20% of the buildings, which were repaired during the last 5 years, still showed significant damage in various elements. It was imputed to inadequate repair standards, inappropriate repair methods or insufficient long-term durability considerations.

The Marble Road canopy collapse case may shed light on the effectiveness of repair on buildings with poor durability. The construction quality of its vintage 1946-1958 was discussed in section 2.1 and its repair record could be traced back to 1972. Buildings Department (1998b) report pointed out that the dilapidation of the building was identified since 1972, four repair orders had been served in 1972, 1979, 1984 and 1992 mainly for reinforced concrete repairs. The former three had been complied with, while the last one was completed by the Government Contractor. It implies that the repair standard and method of the last repair should be in accordance with the Building Authority's requirements. Before the collapse in 1997, the building was inspected again in 1995 and an advisory letter was issued for the repair of loose external rendering, etc. The fact that the building was irreparable was actually intrinsic as the report indicated that the steel bars were misplaced and the strength of concrete was inadequate even to the standard of the original design. In view of the inexorable accelerating trend of depreciation of the property, landlords would probably cover up neatly the inherent construction quality problem in response to the orders.

In public rental housing, when the dilapidation of buildings were beyond repair or unjustified to repair, complete demolition for re-development was easily achievable as the Government was the sole owner. However, in private housing, the irreparable state only renders the reluctance of investment on maintenance. The Building Authority has endeavoured to intensify inspections and require minimal repairs so as to avoid accidents, but the results are less promising.

THE IMPACT OF DURABILITY ON DETERIORATION

The rate of deterioration for building with different durability would be different. It is not only because of the specifications of the materials used, but it is also the result of the level of maintenance applied. The

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[15] Bates (1996)

[16] Reported by Ming Pao Daily (2000, 17 March)

[17] see the minutes of the Selected Committee on Building Problems of Public Housing Units of LegCo in 5 May 2001, and Hong Kong Housing Authority (2000b).

[18] Incidents revealed in private developments include (1) Airport Kowloon Station development (Site A); (2) Airport Hong Kong Station development (North Site); (3) Airport Olympic Station development (Site B); and (4) Residential development in Happy Valley, etc.

[19] The defendant, B+B Construction Co. was fined with $250,000, the maximum imposed by s.40(2A)(b), Buildings Ordinance (Cap. 123). (Ming Pao Daily 2000, 7 Jan.)

[20] PNAP 66, revision June 2000 (Buildings Department 2000)

[21] vested in s.26A and s.26 of the Buildings Ordinance (Cap. 123)

[22] Buildings Department (1995)

theoretical justifications as well as casual observations on the effects of durability to the investment of maintenance are to be presented.

Theoretical Justification

The theoretical justification of the effects is based on the minimisation of the implicit unit service cost of a property. The unit service cost for the utilisation of a property for one year is the sum of (i) the opportunity cost; (ii) deterioration; (iii) capital gains or losses; and (iv) the cost of maintenance. In other words, the unit service cost $\rho_\tau(t)$ of vintage τ at time t is given by:

$$\rho_\tau(t) = r \cdot P_\tau(t) + \delta(D_\tau, \mu_\tau(t)) \cdot E(P_\tau(t+1)) + [P_\tau(t) - E(P_\tau(t+1))] + q_\tau(t) \cdot \mu_\tau(t) \quad (1)$$

where r is the interest rate, $P_\tau(t)$ is the price of the property at time t, δ is the depreciation rate which is assumed to be a geometric constant rate for all ages and depends on D_τ(and $\mu_\tau(t)$. D_τ is the durability factor which is assumed to be fixed at the time of construction τ, and the owner cannot adjust it once after the property was purchased. $\rho_\tau(t)$ is the level of maintenance, which is at the owners' disposal. $EP_\tau(t+1))$ is the expected future price of the property at time $t+1$ and $q_\tau(t)$ is the cost of a unit of maintenance at time t for vintage τ to meet the standard of a new asset. Owners are regarded as price takers in the property market that determines unit property price. Therefore, they are assumed to select the level of maintenance to minimise the implicit unit service cost $\rho_\tau(t)$ of the property at any time $t > \tau$. The efficiency of services is assumed to deteriorate with respect to age $A_\tau(t)$ at a rate - $\delta(D_\tau, \mu_\tau(t))$, which is assumed to be a convex function with D and μ to reflect the notion of diminishing returns, i.e. $\partial P / \partial A = P_A = -\delta < 0$, $\partial\delta/\partial D = \delta_D < 0, \partial\delta/\partial\mu = \delta\mu < 0$, $\partial^2\delta/\partial D^2 = \delta_{DD} > 0$ *and* $\partial^2\delta/\partial\mu^2 = \delta\mu\mu > 0$.

The first order condition for the optimal level of maintenance $\mu_\tau^*(D_\tau, q_\tau(t), P_\tau(t+1))$ to achieve minimum implicit unit service cost will be:

$$\partial\rho_\tau(t)/\partial\mu_\tau(t) = \delta\mu(D_\tau, \mu_\tau(t)) \cdot P_\tau(t+1) + q_\tau(t) = 0 \quad (2)$$

Parks (1979) deduced that lower built-in durability would imply less investment on maintenance and therefore faster rate of deterioration, provided that maintenance and built-in durability are complements in the sense that $\delta_D\mu < 0$:

$$\partial\mu^*_\tau(t)/\partial D = -\delta\mu/\delta\mu\mu > 0 \quad (3)$$

$$\partial\delta(D_\tau, \mu^*_\tau(t))/\partial D = \delta_D + \delta\mu(\partial\mu^*/\partial D) = \delta_D\delta\mu\mu - \delta\mu\delta_D\mu)/\delta\mu\mu < 0 \quad (4)$$

DEPRECIATION AGGRAVATED BY POOR DURABILITY: CASUAL OBSERVATIONS

If landlords are more reluctant to invest on maintaining a poorer quality property than a better one, the market price should differentiate the different extent of deterioration no matter the deterioration is caused by the inherent irreparable quality problem or the lack of maintenance. However, since the extent of deterioration depends on age, the vintage effect has to be distinguished from age effect. Therefore, we take a close scrutiny on the age-price profiles cross-sectionally in two different periods, it will clearly reveal the effect of vintage on their rate of depreciation irrespective to the effect of age. Figure 1 and 2 show the age-log-price scatter profiles of houses in Causeway Bay in 1992 and 1998. The district of Causeway Bay is chosen for its great variety in age but uniform characteristics of neighbourhood. The prices (RUP) of houses are in real term of 1995 price levels and in unit rate per square foot of saleable area. The regression line is the best fit by ordinary least squares in assuming constant rate of depreciation.

It manifests the shift of a cluster below the regression line from age 20s in 1992 to 30s in 1998. The cluster refers to the faster rate of depreciation for the vintage of the 60s. Figure 3 directly plots the scatter diagram of log-RUP against date of completion (OP_date). It concurs with the higher rate of depreciation

for the vintage of 1960s, and it coincides with the technical findings on the construction quality of buildings in Hong Kong.

Undeniably there may be many other reasons instead of vintage quality issue causing the higher rate of depreciation. More rigorous empirical studies are required to establish the relationship. However, it is well recognised the linear dependence among time, age and vintage variables in performing hedonic pricing model. Before carrying out empirical study, the method to disentangle the vintage effect is necessary.

CONCLUSIONS

In this paper, a brief review of building quality of different vintages was reviewed and a casual observation on the rates of depreciation in different vintages was presented. Rigorous empirical study will be carried out separately. The aim is to identify the vintage effect and the effect of price expectation on deterioration. The results show that the durability of the vintages of 1950s and 1960s is inherently low and the low durability of the houses will deter the owners from investing on their maintenance. In the light of the building boom in the 1960s, the poorer quality of this vintage has a sweeping consequence to the overall rate of deterioration of the city. In fact, if the issue of construction quality is not respectfully addressed especially during the time of building booms, spates of dilapidation will emerge again and again. Undoubtedly, further study on the relationship between building boom and construction quality is also warranted.

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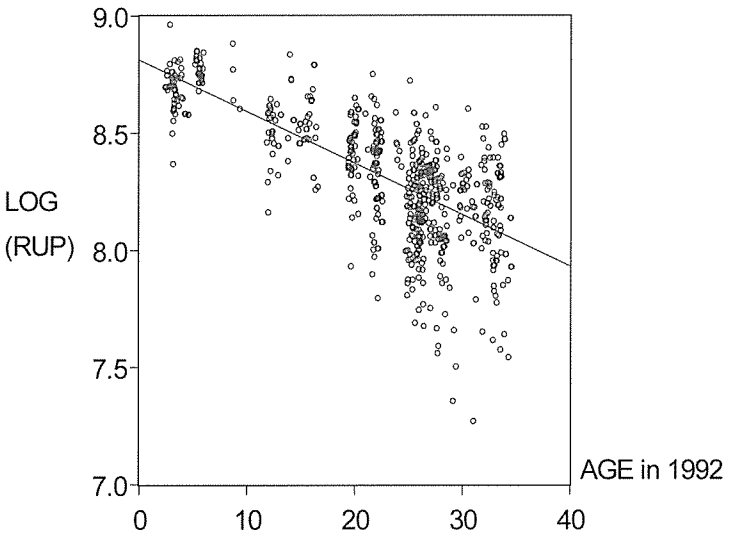

Figure 1: Age-log Price Profile of Private Housing in Causeway Bay in 1992

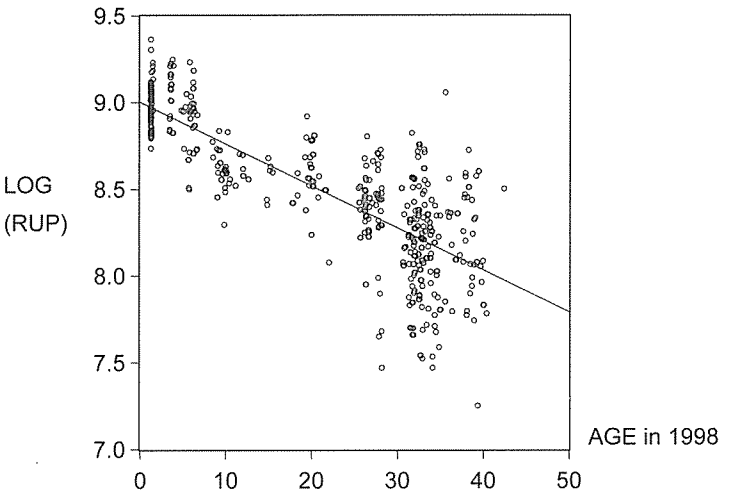

Figure 2: Age-log Price Profile of Private Housing in Causeway Bay in 1998

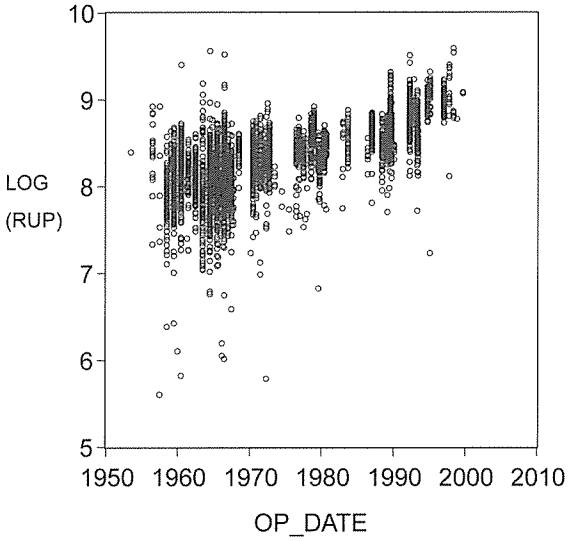

Figure 3: Log Price against Date of Completion of Private Housing in Causeway Bay

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REVIEW OF THE STATUS OF UNAUTHORIZED BUILDING WORKS IN HONG KONG

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ABSTRACT

This paper reviews the current status of unauthorized building works in Hong Kong, the changes of policy toward them, and previous large-scale inspection and removal operations. We find that great sums of taxpayers' money have been invested in trying to eradicate the problem in recent decades, but the progress has been slow and unaffordable. The process should be streamlined, and the method of inspection should be enhanced and rendered cost effective.

Keywords: Unauthorized Building Works, illegal structures

INTRODUCTION

In 1988 there were an estimated 1,000,000 illegal structures on 60,000 private buildings in Hong Kong (Wong 1988). Twelve years later there were still 800,000 illegal structures, and an estimated 10,000 new unauthorized building works (UBWs) were undertaken every year (Ming Pao Daily 2000a). In other words, the average net decrease in UBWs was only around 6,500 per annum. If the present rate of erection and clearance follow this trend, then it will take another 123 years to eradicate the problem.

Lai and Ho (2001) explain that the economic incentive for owners to build UBWs is to improve their living environments by increasing space and facilities, etc. However, in a highly dense city with high-rise buildings such as Hong Kong, the tolerance of UBWs poses a high risk to the public. Table 1 shows a sample of the accidents that have been related to UBWs since 1990.

CONTROL OF UNAUTHORIZED BUILDING WORKS

Section 14 of the Buildings Ordinance (Cap. 123) stipulates that the commencement of building works requires Building Authority (BA) approval of specified documents. Building works that are in contravention of the stipulations are regarded as UBWs. Furthermore, sub-section 42(5) explicitly states that the BA's powers of exemption do not apply to section 14. Although Wojtowicz (1984), among others, suggests that we should accept UBWs subject to a professional's certification, retrospective approval or consent is prohibited, as upheld in **Yeung pui yee v Building Authority** [1988] MP No. 930. Justice Godfrey held that the "BA has no power to give retrospective approval or consent in respect of building works which have already been commenced, carried out or completed". Building Appeal case number 48/94 for Mirador Mansion was settled with the same argument (Lai and Ho 2000).

Those found guilty of contravening section 14(1) face a fine of $100,000 and imprisonment for 2 years; and a fine of $5,000 for each day that the offence continues (section 40 of the Buildings Ordinance). In addition, section 24 empowers the BA to serve order to demolish UBWs.

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Date	Accidents	No. of deaths and injures
17.8.90	Collapse of a canopy with UBWs in Mong Kok	1 / 0
27.10.90	Collapse of a canopy with UBWs in To Kwa Wan	6 / 9
15.10.93	Collapse of a balcony with UBWs in Yau Ma Tei	0 / 4
1.8.94	Collapse of a canopy with UBWs in Aberdeen	1 / 16
15.11.95	Collapse of an illegal canopy in Kwun Tong	1 / 2
16.4.97	Collapse of a canopy in Kwun Tong	1 / 0
19.7.97	Collapse of a balcony in North Point	0 / 5
21.10.97	Collapse of an illegal cantilevered metal cage	0 / 1
6.1.98	Fire in unauthorized alterations in an exit route in North Point	2 / 49
31.7.98	Collapse of an illegal canopy in Kwun Tong	1 / 3
14.9.98	Fire in tin huts illegally built in Wan Chai	2 / 13
3.10.98	Fire on a rooftop with illegal structures in Mong Kok	0 / 0
11.12.98	Fire on a rooftop with illegal structures in Sau Mau Ping	0 / 0
17.1.99	Fire on a rooftop with illegal structures in North Point	0 / 0
9.2.99	Fire on a podium with illegal structures in Kwai Chung	0 / 5
24.2.99	Fire in a flat with an illegal alteration in Mong Kok	0 / 0
7.5.99	Fire in an illegally built workshop in Kwun Tong	0 / 0
10.8.99	Falling of masonry from an illegally built canopy in Mong Kok	1 / 0
11.8.99	Collapse of an illegally built ceiling in North Point	0 / 0
10.9.99	Collapse of an illegally built ceiling in Mong Kok	0 / 1
3.10.99	Collapse of an illegally built podium in Tai Kok Tsui	0 / 2
22.11.99	Fire in illegal structures behind a building in Yau Ma Tei	1 / 8
1.12.99	Fire in an illegal structure on a rooftop in Sham Shui Po	1 / 2
2.3.00	Fire in an illegal rooftop structures in Tsuen Wan	2 / 5
2.12.00	Fire in an illegal rooftop structure in Hung Hom	0 / 0
2.3.01	Fire in an illegal rooftop structure in San Po Kong	0 / 0
7.3.01	Collapse of external walls of illegal rooftop structures during demolition in Ngau Tau Kok	0 / 0
17.4.01	Collapse of an illegally built canopy in Kowloon City	0 / 1
8.6.01	Collapse of the roof of an illegally built unit in Chai Wan	0 / 0
25.3.02	Collapse of an illegal balcony in To Kwan Wan	0 / 7
11.8.02	Collapse of an illegal balcony during demolition in Kwun Tong	1 / 2

Source: Lai and Ho (2001). Task Force of Building Safety and Preventive Maintenance; Ming Pao Daily (2002)

Table 1: Sample of accidents related to UBWs, 1990-2002

The following are examples of common UBWs in Hong Kong:

1. Cages, canopies, metal flower racks, any projection from the external wall of a building;
2. Canopies and structures that project over government land, pavements, or lanes;
3. Structures on rooftops, flat roofs, yards, or light wells; and
4. Metal supporting frames for air-conditioning plants and cooling towers.

Figure 1: Illegal structure

Figure 2: Illegal Balcony

REMOVAL AND POLICY ON UNAUTHORIZED BUILDING WORKS

The Control and Enforcement Section of the Buildings Ordinance Office (BOO, the present Buildings Department) was formed in 1966 to investigate the extent of illegal alterations to existing buildings. Due to the heavy workload, approximately 17% of the Department's staff was deployed in controlling UBWs (Buildings Department 1999). In the wake of a series of fatal accidents due to UBWs in 1999, ad-hoc funding of $90 million for recruiting 150 extra staff members was allocated in an effort to target the removal of unauthorized rooftop structures on single staircase buildings. However, only 6% (50,000) of the total UBWs were demolished in the 3-year funding period, which was more or less the average rate of removal in 1988-2000.

In fact, UBWs have long existed with government connivance due to the shortage of resources in Hong Kong. In 1975 government policy gave priority to the removal of UBWs that posed hazards to life and limb and which were in progress when a complaint was received (Lai and Ho 2001). Then, in its 1988 policy, the Public Works Department adopted a pragmatic approach by "sanctioning" the existence of UBWs that had been built before 1975. Resources could then be concentrated on "significant new" UBWs that created "imminent danger" (Buildings Ordinance Office 1986). Yet, even with such a prioritization, the number of complaints about UBWs still exceeded 13,000 a year (Buildings Department 1998, 2002). The 1988 policy also gave rise to the widespread misunderstanding of the government's position. For example, Building Appeal Case 38/94 centered on a misconception about the definition of "significant new" (Lai and Ho 2000).

In the wake of a series of fatal accidents that were caused by fallen illegal structures in late 1999, the government set up a task force on Building Safety and Preventive Maintenance, with the removal of UBWs as one of its focal points. The 1988 policy was then revised and reformed as the 2001 enforcement policy against UBWs (2001 Policy), which refocused priorities on the removal of imminent danger, new

items, and environmental nuisances, etc. The new policy was implemented along with the following actions:

- The Building Safety Improvement Loan Scheme was introduced in 1998 to provide financial support to property owners;
- The number of staff members in the Control and Enforcement Section of the Buildings Department was increased greatly;
- Contracts for inspecting unauthorized building works were outsourced to private companies;
- "Blitz" UBW clearance operations were undertaken; and
- "Guidelines for the removal of typical Unauthorized Buildings Works and General Maintenance of External Walls" were issued in 2000.

Previous large-scale clearance operations

Throughout the last three decades, the government removal of UBWs was like an elephant trying to get rid of a mouse on its body. Different district boards cooperated with the BOO to carry out operations, but they achieved only short term results and the UBWs were soon re-built. There were several large scale operations to remove UBWs. For instance, in 1983 the Shum Shui Po District Board set aside $150,000 to remove 1,000 illegal structures. During the first phase, 170 structures, 57 canopies, and 54 shop extensions were removed. The second phase saw the removal of 481 illegal structures (SCMP 1984a). In 1984, the government launched one of its biggest clearance operations against a multi-storey building in San Po Kong with nearly 650 illegal extensions (Chan 1984). In 1991, Operation Appendages targeted illegal structures on 30 buildings: 3,800 statutory orders were served, demanding the removal of 5,800 illegal additions. Another scheme, Operation Catherine Wheel, focused on 52 buildings and issued 6,800 advisory letters about the removal of 11,160 illegal projections. These operations were appraised as successful, with a 55% clearance rate (Sinclair 1993). However, after the aforementioned series of incidents in 1999, the issue of UBWs again made headlines. The Building Authority set out to eradicate the problem, and served 17,000 advisory letters and 7,600 statutory orders on the owners of 300 blacklisted buildings that housed over 8,000 illegal structures. Even UBWs that had been built before 1975 were not sanctioned, in view of the high risk of the targeted buildings (Ming Pao Daily 1999e).

The current large-scale blitz clearance operation

The Buildings Department has conducted a series of large-scale "blitz" clearance operations since 2001. These operations mainly target the removal of unauthorized building works on external walls. For example, on 7 May 2001 a large-scale blitz clearance operation was conducted in 13 streets of Mong Kok and Tsim Sha Tsui, covering 330 aged buildings (Mingpao 2001a). Another operation was held in June 2001. About 130 professional and technical staff members were mobilized to take part in a three-day operation that covered 85 buildings in Western District, 153 buildings in Tai Kok Tsui, and 71 buildings in Tsuen Wan.

Buildings Department (2001b) is satisfied with the results of the operation and writes that "with the stepping up of blitz operation last years, the Buildings Department has succeeded in removing more than 20,000 unauthorized building works, instead of the original target of 15,000".

Outsourcing of blitz operations

According to Buildings Department (2001b), the Buildings Department has outsourced 60 contracts to 29 private consultant companies to enhance the efficiency of inspecting UBWs mainly on external walls.

These contracts cost $57 million and cover more than 3,200 buildings. According to the Buildings Department (as cited in Ng, 2001), "handling over the inspection and clearance work to private firms would enhance cost-effectiveness. The department could cover only 1,000 blocks a year."

Extra recruitment in the blitz operations

Before the blitz operations, approximately 1,000 staff members of the Buildings Department tackled UBWs. However, the Department has since recruited an additional of 400 staff members to enhance the removal of UBWs, with extra funding of approximately $70 million a year. Buildings Department (2001b) states that the additional workforce will allow the formation of a special action squad to provide inspection within one week of receiving a compliant.

Type	Number of contract posts in Buildings Department	Private Companies
Professional (Architect, Engineer and Surveyor)	120 ($35,000)	60
Technical person (with high diploma certificate)	200 ($15,000-$20,000)	240
Logistics officer	80 ($10,000 or below)	---
Total	**400**	**300**

Source: Ming Pao Daily (2001c).

Table 2: Additional staff members and outsourced manpower for the inspection of UBWs.

EVALUATION

Table 3 shows the number of reported UBWs and the number of UBWs that were removed from 1990 to 2002. It reveals a significant increase in the number of removals after 1999. The average number of removals per annum from 1990 to 1998 was only 4,853, while the average number of removals per annum from 1999 to 2001 greatly increased to 12,617 (a 160% increase).

Buildings Department (2001b) is aggressive in believing that with such an enforcement policy, the operations will remove around 150,000 to 300,000 UBWs in five to seven years.

Year	Reports received about UBWs	Removal of UBWs
1990	7,009	2,269
1991	7,420	6,857
1992	6,992	6,969
1993	8,437	8,759
1994	7,596	4,890
1995	8,203	3,883
1996	9,913	3,479
1997	12,427	3,103
1998	13,163	3,471
1999	17,014	14,038
2000	15,860	10,602
2001	13,817	13,212
2002 (target)	11,000	25,000

Source: Lai and Ho (2001), Buildings Department (2002); Ming Pao Daily (2000b)

Table 3: No. of reports received and no. of removals

The government has invested more than $57 million in recruiting additional staff members and enhancing the efficiency of removing UBWs in 2000-2002. An estimated 3,000 buildings were inspected during this period. Table 4 shows the dramatic increase in the number of buildings with UBWs that were targeted for clearance.

Year	1999	2000	2001	2002
No. of buildings targeted for clearance of UBWs	100	404	1574	1500

Source: Buildings Department (2002).

Table 4: No. of buildings targeted for clearance of UBWs

However, at the existing rate it will take another 63 years to completely remove the 800,000 UBWs in Hong Kong, assuming that no new UBWs are erected. In other words, the great investment cannot eradicate the problem. Each inspection cost approximately $5,000 in 1999-2002, and it will require another $4 billion just to inspect the existing UBWs (without accounting for the costs of removal). We are not discussing whether we should remove UBWs or not. Instead, we are pointing out that new methods to reduce inspection and removal costs will be highly relevant in the long term.

CONCLUSION

The recent upsurge in the inspection and removal of UBWs is encouraging. Several strategies have been used to tackle the problem, including education, publication, clearance operations, and increasing the workforce by recruitment and outsourcing. This has greatly increased the rate of removing UBWs in the last 3 years. However, an evaluation of the investment reveals that the average cost of inspecting UBWs is very high. It will certainly pay to streamline the process and carry out research with the aim of enhancing visual inspection.

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STRENGTHS AND WEAKNESSES OF QUANTITY SURVEYING GRADUATES IN HONG KONG

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ABSTRACT

Concerns have been raised by the Hong Kong construction industry on the readiness of graduates to handle practical tasks. Seamless communication between universities and the industry on this issue would serve to bridge this gap. The needs of the industry could then be recognized and new courses developed by the universities. This paper reports on a study of the professional knowledge areas and skills required of quantity surveying practices, as perceived by supervisory surveyors and surveying graduates. Focus is placed on: (1) the levels of importance of professional knowledge areas and skills; (2) the levels of satisfaction with the performance of quantity surveying graduates (for supervisory surveyors only); and (3) the levels of satisfaction with the university education (for surveying graduates only). Through the comments of supervisory surveyors and surveying graduates, the needs of the industry as well as the strengths and weaknesses of current quantity surveying graduates are identified. The survey results suggest several key areas with which graduates from quantity surveying program should be conversant. These include professional practice knowledge and skills in measurement, negotiation, communication and analytical thinking.

Keywords: Quantity Surveying Graduates, Knowledge, Skills, Importance, Satisfaction

INTRODUCTION

Designing educational programs and evaluating graduates' effectiveness are important for the health of all professional and academic disciplines including quantity surveying (refer Corotis and Scalan 1989). Construction education in terms of knowledge and skills has been discussed within different disciplines such as civil engineering (Popescu 1987; Jester 1989), construction methods (Laufer 1987), professional skills (Karbhari 1989; Betts et al. 1993), construction management (Arditi 1984; Faulkner et al. 1989; Egbu 1999; Fraser 2000) and occupational safety (Laukkanen 1999). For the quantity surveying practice in the higher education, various publications have been issued to establish a framework for the future of quantity surveying services (Seeley 1976; RICS 1963, 1971, 1978, 1983, 1989, 1992; Davis, Langdon and Everest 1991; Ashworth 1993, 1994; Nkado and Meyer 2001; Leung et al. 2002). However, there is still little research investigating the actual performance of quantity surveying graduates in Hong Kong. In order to establish a new framework for the future of quantity surveying services, strengths and weaknesses of current quantity surveying graduates have to be identified at first.

This paper first outlines the professional knowledge areas and skills necessary to perform in the practice of quantity surveying. In this regard, the views of supervisory quantity surveying practitioners were sought on the relative importance of various knowledge areas and skills. In addition, their opinions of the strong and weak knowledge areas and skills of recent quantity surveying graduates were solicited. The relative strengths and weaknesses were based on the levels of importance of and the levels of satisfaction with the professional knowledge areas and skills employed in quantity surveying practice.

A similar survey was also conducted with quantity surveying graduates. Graduates with more than 33

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months of postgraduate experience are allowed to apply for professional competency assessment by their professional institutions in both the United Kingdom and Hong Kong. Therefore, surveyors with less than two years of experience were considered to be quantity surveying graduates in this study. This similar survey served to cross-check the results obtained in the supervisory group. The differences in the comments between the supervisory group and the graduate group are suggested as areas for further improvements to university studies in quantity surveying.

KNOWLEDGE AREAS AND SKILLS

Traditionally, preparing bills of quantities and measuring variations for construction projects are the lifeblood of quantity surveying practices (RICS 1984). In the last ten years, quantity surveying firms have endeavoured to provide services covering both traditional and 'extended' quantity surveying services (Carter 1990; Kelly and Male 1987; RICS 1991). 'Extended' quantity surveying services include project management, value management, facilities management, development appraisal, valuation of insurance, disputes and arbitration consultancy, maintenance management, etc.

In order to meet with the expectations of a dynamic construction industry, quantity surveyors have to be equipped with sufficient and appropriate knowledge and skills (Brandon and McDonagh 1991). RICS (1992) indicates that *knowledge* is related to the professional services in a dynamic market, while skills are the ability to apply techniques effectively and efficiently to the problems encountered. Based on the dynamic nature of quantity surveying practices, the knowledge areas required of quantity surveyors can be classified into five main areas including technology, professional practice, economics, management and contract law (RICS 1992). The core skills are communication, drawing, taking-off, computation, negotiation, analytical thinking and team working (Brandon and McDonagh 1991; Betts 1993). The main knowledge areas and skills of quantity surveying practice are listed in Table 1.

Knowledge Areas	Skills
1. Technology	1. Drawing and sketching skills
2. Quantity Surveying Practice	2. Taking-off skills
3. Economics	3. Computation skills
4. Legal	4. Communication skills in English and Chinese
5. Management	5. Team working skills
	6. Analytical skills
	7. Negotiation skills

Table 1: Knowledge Areas and Skills for Quantity Surveying Services

Knowledge Areas

Construction technologies include building technologies, structures, materials, services, etc., which are normally considered to be the fundamental knowledge of a construction professional. Quantity surveyors need to understand construction procedures, methods and materials for cost estimating and pricing (refer Packer 1996; Willis and Newman 1988; Ostwald 2001). Therefore, construction technology underpins a quantity surveying degree program.

Quantity surveying practice consists of cost control, tendering, contract administration, etc. which support the core quantity surveying services (Willis and Newman 1988; Smith 1994; Wills et al. 1994; Hills 1995; Murdoch and Hughes 2000; RICS 1992). In Hong Kong, construction projects normally have to be completed with limited time and funds. Therefore, cost management can assist the client in selecting the best design in the initial stage. Indeed, provision of cost management services maximises both the turnover and profitability of all types of practice and sizes of business. Quantity surveying practice is thus considered to be one of the major quantity surveying knowledge areas in the undergraduate course.

Development appraisal is critical for construction clients. Quantity surveyors are sometimes requested to prepare a feasibility study at the strategic planning stage. Knowledge of *construction economics* is a desirable quality when performing this task (Darlow and Marley 1982; Smith 1994; Smith 1995; Ostwald 2001). To this end, undergraduate training should include site acquisition, demand analysis, feasibility testing, methods of funding, cost estimating, tax forecasting, project planning, property marketing, financing arrangements, etc.

Additionally, building contracts usually provide a clause covering disputes and arbitration (RICS (HK Branch) 1986). In a dispute process, the engaged surveyor has to prepare evidence and plays an 'expert witness' role with regard to technical particulars of the building contract (Seeley 1997). Therefore, the quantity surveyor has to be equipped with *legal* knowledge to provide professional contractual advice in construction projects (Hills 1995; Turner 1994; Murdoch and Hughes 2000).

A successful project requires expert advice from all building professionals. A quantity surveyor with good knowledge of financial, legal, contractual and technical aspects can support the entire *management processes,* including project management, construction management, value management and facilities management (RICS 1991). This can extend to assisting the client to identify the best value based on knowledge of construction technology, life cycle costing, space costing, etc. (refer Kelly and Male 1987; Ashworth 1996). Therefore, a quantity surveying degree course should cover management knowledge and skills that are needed for construction projects.

Skills

Drawing, sketching skills and taking-off skills are the fundamental techniques of construction professionals, especially in quantity surveying practices (Willis and Newman 1988). In order to calculate the total building cost, quantity surveyors need to measure building quantities from architectural, structural and building services drawings. Recently, various computational programs have been applied to cost control in the pre-contract and post-contract stages (Johnston and Mansfield 2001). The result is that computation skills have become an essential skill for quantity surveyors.

Quantity surveying practice in Hong Kong covers a lot of documentation works that may be presented in English and/or Chinese. *Communication skills* in English and Chinese are, thus, important for quantity surveyors in Hong Kong for both local and international construction projects. Moreover, a construction project is a team effort that involves various project participants such as clients, consultants, contractors, etc. (Walker 1996). *Team working skills* are therefore important for quantity surveyors cooperating with the other professionals in the project team.

In an Asian construction education study (Betts et al. 1993), the development of analytical skills and thinking was ranked as the most important objective in comparison with the other 12 educational objectives identified. In practice, two quantity surveyors are normally employed for a particular project by the client and the contractor respectively. The consulting quantity surveyor who represents the client negotiates the contract sum and claims with the contractor's quantity surveyor. Good *analytical skills* and *negotiation skills* are, thus, essential skills for a quantity surveyor for controlling the construction project cost.

In sum, quantity surveying graduates have to be equipped with professional knowledge and skills for professional performance. This paper reports a study supported by the CityU Center of Enhancement on Learning and Teaching. The purpose of the study has been to investigate and identify the strengths and weaknesses, in terms of knowledge areas and skills, of quantity surveying graduates in Hong Kong.

RESEARCH METHODOLOGY

A questionnaire survey was used to identify the essential knowledge areas and skills of quantity surveying graduates. The questionnaire consisted of three parts: (1) background information about the respondents; (2) the level of importance of the knowledge areas and skills of quantity surveyors; and (3) the level of satisfaction with the performance of graduates (for supervisory surveyors only) / the level of satisfaction with university education (for surveying graduates only). The questionnaire included 5 main knowledge areas and 7 skills (see table 1) within quantity surveying practice. For each knowledge area and skill, the respondents responses provided numerical scores expressing their opinions on levels of importance in quantity surveying practice and levels of satisfaction with the performance of surveying graduates. The weighting range was from 1 to 5 where 1 is the least important and 5 is the most important. The target respondents in this survey were mainly classified into two major groups: (1) a supervisory group, including directors, chartered quantity surveyors and senior quantity surveyors; and (2) a graduate group, including surveyors who had less than two years of industry experience.

The questionnaire was randomly send out to the companies listed in Building Directory 1999/2000 and the HKIS Annual Report 1998. A total of 72 and 34 questionnaires were returned from supervisory and graduate groups respectively, representing 40% of the 180 and 34% of the 100 sent out. Of supervisory respondents, 54% and 28% work in quantity surveying consulting firms and public authorities respectively, while 63% and 25% of graduate respondents work in quantity surveying consulting firms and main contracting companies respectively. The majority of supervisory respondents (82%) had over 10 years of working experience in the construction industry, while all the graduate respondents had two years or less than two years of working experience. Therefore, the supervisory group in this survey reflects the actual needs of quantity surveying practice in the construction industry.

Working Experiences	Supervisory Level		Graduate Level	
	Director /Associate QS	Chartered QS /Senior QS	QS with less than 2 years of experience	**Total**
Below 2 years /2 years	0	0	34	34
2 - 5 years	0	3	0	3
5 - 10 years	3	7	0	10
Over 10 years	31	28	0	59
Total	**34**	**38**	**34**	**106**

Table 2: Background Information about Respondents

Both mean and relative importance indices (Shash 1993; Chinyio et al. 1998) were applied to rank and compare the knowledge areas and skills.

$$\text{Mean} = \frac{\text{Total of weighting in each knowledge area}}{\text{Total sample number}}$$

$$\text{Relative Importance Index} = \frac{\text{Total of weighting in each knowledge area}}{\text{Highest weight (5 in this survey)} \times \text{Total sample number}}$$

After calculating the importance index of each knowledge area and skill within groups for both the supervisory group and graduate group, an independent t-test on the mean scores was used to test the

differences. According to the statistical table, the calculated value of t was +1.96 /-1.96. If the calculated value of t falls between the two critical values (-1.96 < t < +1.96), the null hypothesis is accepted and it is concluded that there is no significant difference between them. If the calculated value of t is smaller or larger than the statistical value of t, the null hypothesis has to be rejected and it is concluded that there is a significant difference between the two samples.

Descriptions	Supervisory Group			Graduate Group			T-test*	
	Mean	RII	Ranking	Mean	RII	Ranking	Sig.	Mean diff.
a. Technology knowledge	3.29	0.658	9	3.30	0.660	10	0.977	-3.99E-03
b. Professional practice knowledge	3.89	0.778	7	3.85	0.770	7	0.756	4.33E-02
c. Management knowledge	3.11	0.622	10	3.26	0.652	11	0.280	-0.155
d. Economics knowledge	3.03	0.606	11	3.34	0.668	9	0.038*	-0.308
e. Legal knowledge	3.48	0.696	8	3.59	0.718	8	0.401	-0.115
f. Communication skills	4.16	0.832	4	4.07	0.814	5	0.587	8.36E-02
g. Drawing and sketching skills	2.13	0.426	12	2.21	0.442	12	0.694	-8.71E-02
h. Taking-off skills	4.63	0.926	1	4.26	0.852	3^	0.026*	0.360
i. Computation skills	3.97	0.794	6	3.91	0.782	6	0.754	6.05E-02
j. Negotiation skills	4.01	0.802	5	4.26	0.852	2^	0.166	-0.251
k. Analytical skills	4.21	0.842	3	4.38	0.876	1	0.370	-0.174
l. Team working skills	4.22	0.844	2	4.09	0.818	4	0.451	0.134

Note: RII means relative important index; and
(*) - Rejection region - R:{T<-1.96; T>+1.96}; and
(^) standard deviation of the item j (0.666) is smaller than the item h (0.864).

Table 3: Levels of Importance of Knowledge Areas and Skills for Quantity Surveying Graduates

RESULTS

Important Knowledge Areas and Skills

The results of part II of the survey are listed in Table 3, including the importance levels of knowledge areas and skills for the quantity surveying graduates, as ranked by both the supervisory group and the graduate group.

Table 2 indicates that most professional skills (items f, h-l), except for drawing and sketching skills (item g), were ranked higher than the knowledge areas (items a-g). Drawing and sketching skills were rated as the least important skills for a quantity surveying graduate (RII 0.426 /0.442). The supervisory groups consider that taking-off skills (0.926), team working skills (0.844) and analytical skills (0.844) are the top three most important skills, while the quantity surveying graduates' view was that analytical skills (0.876), negotiation skills (0.852) and taking-off skills (0.852) are the most important skills for their jobs.

Based on the results of an independent t-test, both taking-off skills and economic knowledge showed significant differences between the two groups on the importance of knowledge areas and skills. The supervisory group rated the importance level of taking-off skills much higher than the graduate group. The supervisory group also thought that the graduates need not learn very much economic knowledge such as accounting, property finance and investment in undergraduate study. These results reflect a divergence in views on the importance of a basic skill (taking-off) and skills necessary in a managerial capacity (economic knowledge).

Level of Satisfaction

In order to identify the strengths and weaknesses of surveying graduates, the supervisory group was asked to contribute their comments on the level of satisfaction with the performance of surveying graduates. However, it is difficult to assess the graduates' performance in the industry by using the graduates themselves. Therefore, this study asked surveying graduates to rate their level of satisfaction with the education provided by the universities. It is assumed that the graduates' perceived comments on satisfaction with universities' education reflects their perceptions of strengths and weaknesses of performance in the industry.

The results of part III of the survey (i.e. means and relative important indices) are listed in Table 4. These results were used for ranking and comparison of the level of satisfaction with the performance of surveying graduates (for supervisory surveyors) and the level of satisfaction with the education provided by the universities (for the surveying graduates).

Descriptions	Supervisory surveyors' satisfaction with graduates			Surveying graduates' satisfaction with education			T-test*	
	Mean	RII	Ranking	Mean	RII	Ranking	Sig.	Mean diff.
a. Technology knowledge	2.75	0.550	9	2.97	0.594	6	0.312	-0.196
b. Professional practice knowledge	2.81	0.562	8	2.76	0.552	10	0.755	6.029E-02
c. Management knowledge	2.94	0.588	3	3.53	0.706	2^	0.000*	
d. Economics knowledge	2.93	0.586	4	3.00	0.600	5	0.825	-5.06E-02
e. Legal knowledge	2.88	0.576	6	3.62	0.724	1	0.000*	-0.744
f. Communication skills	2.88	0.576	6	2.82	0.564	8	0.811	5.147E-02
g. Drawing and sketching skills	2.61	0.522	11	2.32	0.464	12	0.071	0.360
h. Taking-off skills	2.44	0.488	12	2.44	0.488	11	0.921	2.132E-02
i. Computation skills	3.68	0.736	1	2.94	0.588	7	0.000*	0.771
j. Negotiation skills	2.64	0.528	10	2.79	0.558	9	0.374	-0.144
k. Analytical skills	2.89	0.578	5	3.06	0.612	4	0.362	-0.146
l. Team working skills	3.19	0.638	2	3.53	0.706	3^	0.114	-0.317

Note: RII means relative importance index;
(*) - Rejection region: {T<-1.96; T>+1.96}; and
(^) standard deviation of item c (0.861) is smaller than the item l (1.051).

Table 4: Level of Satisfaction with the Performance of Surveying Graduates and Universities' Education

The results show that the performance of surveying graduates in computer usage skills (i), team working skills (l) and management knowledge (c) highly satisfied the supervisory surveyors (RII = 0.736, 0.638 and 0.588), while the graduate group expressed that legal knowledge (e), management knowledge (c) and team working skills (l) are the top three satisfactory knowledge areas and skills learned in the universities (RII = 0.724, 0.706 and 0.706). Basically, both of them were dissatisfied with the graduates' skills in taking-off as well as drawing and sketching skills (RII = 0.488 /0.488 and 0.522 /0.464).

The results of an independent t-test show that two necessary knowledge areas (i.e management (c) and legal (e)) and one essential skill (i.e. computer (i)) showed significantly different levels of satisfaction between the supervisory group (in terms of the knowledge and skills preformed by the surveying graduates) and the graduate groups (in terms of the knowledge and skills learned in the universities). The supervisory group commented that graduates are not equipped sufficiently for the managerial and legal areas of the industry, while the graduates had confidence in these two particular areas, which they ranked as the two most satisfactory knowledge areas learned in the universities. In contrast, the graduates were dissatisfied

with their computation skills, while the supervisory group considered that they have learned excellent computation skills for quantity surveying practice.

The Relationship Between Importance and Satisfaction

Based on the level-of-importance results, the knowledge areas and skills are classified into three main groups: (1) essential /critical knowledge areas and skills (rating at least 3.67 on the 5-point scale); (2) necessary/apparent knowledge areas and skills (1.33-3.67); and (3) supplementary/tolerable knowledge areas and skills (less than 1.33). Based on the level-of-satisfaction results, the knowledge areas and skills were divided into two main groups: (1) strong knowledge areas and skills (with a rating of at least 3.00 on the 5-point scale); and (2) weak knowledge areas and skills (less than 3.00). In this paper, key relationships are presented in a six-category diagram (see figure 1). These include: relationships between the important knowledge areas and skills and the satisfaction with the performance of graduates in terms of knowledge areas and skills; and between the important knowledge areas and skills and the satisfaction with university education.

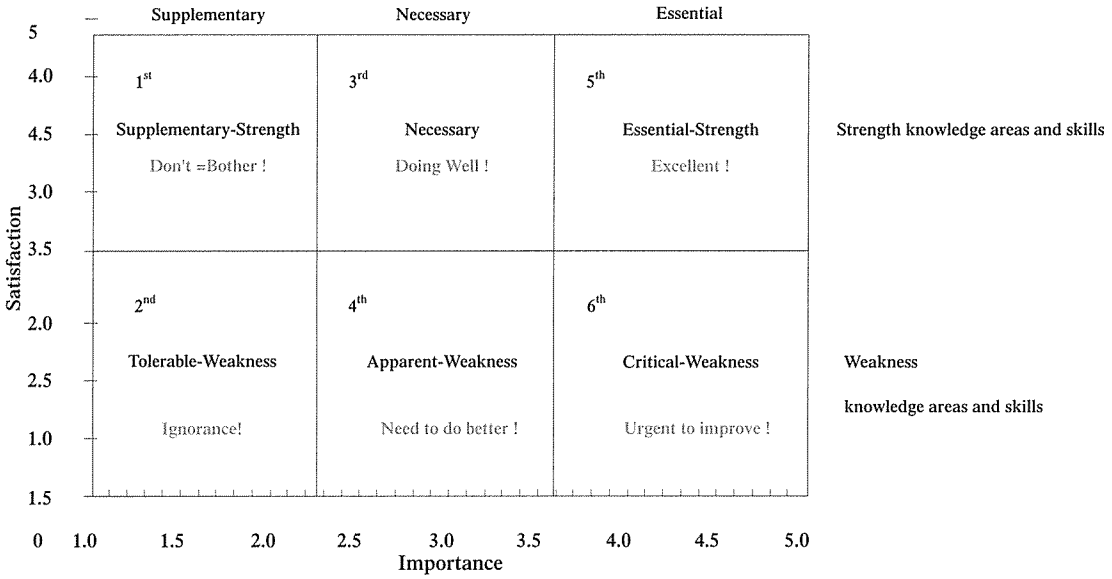


Figure 1: Relationship between Importance of Satisfaction with Knowledge Areas and Skills

The first category represents the supplementary knowledge areas and skills with high satisfaction. Therefore no concerns need be held for these knowledge areas and skills which are possessed by the graduates. The second category represents the supplementary knowledge areas and skills with low satisfaction. In this case, practitioners have not emphasised these supplementary knowledge areas and skills in their practices. Thus the universities need not spend a lot of time on the knowledge areas and skills that fall in this category. The third category represents the necessary knowledge areas and skills with high satisfaction. The universities are providing enough education to the graduates to acquire these knowledge areas and skills. The fourth category represents the necessary knowledge areas and skills with low satisfaction. The universities should pay more attention to these knowledge areas and skills to improve the performance of surveying graduates and, simultaneously, fulfil the expectations of professional quantity surveyors in the industry. The fifth category represents the essential knowledge areas and skills with high satisfaction. Since the universities have used excellent approaches, they should continue their original teaching methods and approaches to construction education in these areas. The sixth category represents the essential

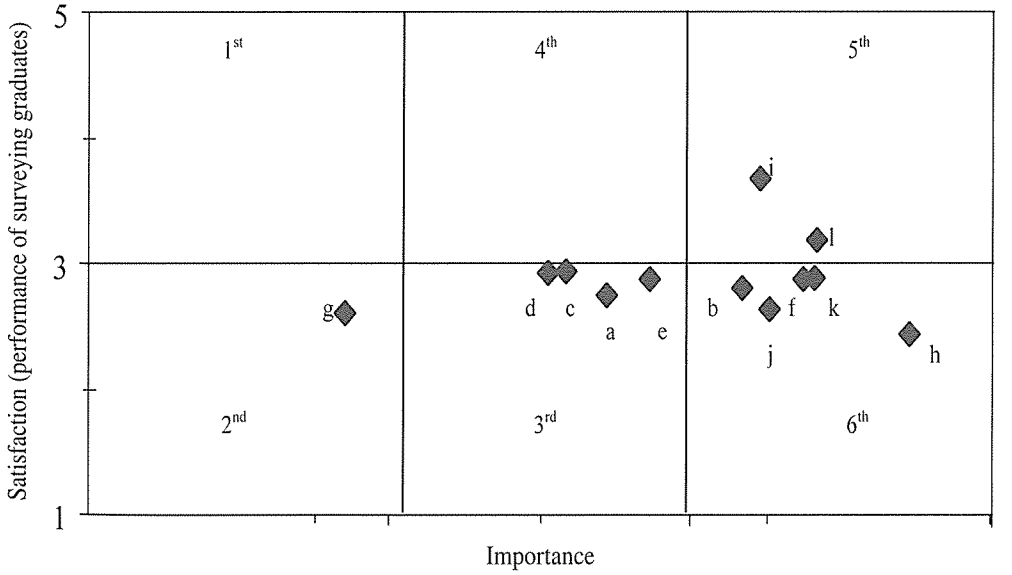
knowledge areas and skills with low satisfaction. Knowledge and skills that fall in this category should be studied in detail by both practitioners and academics in the future, in order to improve graduates' knowledge and skills and to fulfil professional expectations.

The supervisory group's comment on the relationships between the levels of importance of and the levels of satisfaction with knowledge areas and skills of surveying graduates are illustrated in figure 2. The graduate group's comment on the relationships between the levels of importance of and the levels of satisfaction with knowledge areas and skills learned in the universities are shown in figure 3.

Basically, there were no significant differences in perception between the supervisory group and the graduate group, except for two necessary knowledge areas (management (c) and legal (e)) and one essential skill (computation (i)). As discussed, the graduates need to improve their managerial and legal knowledge areas.

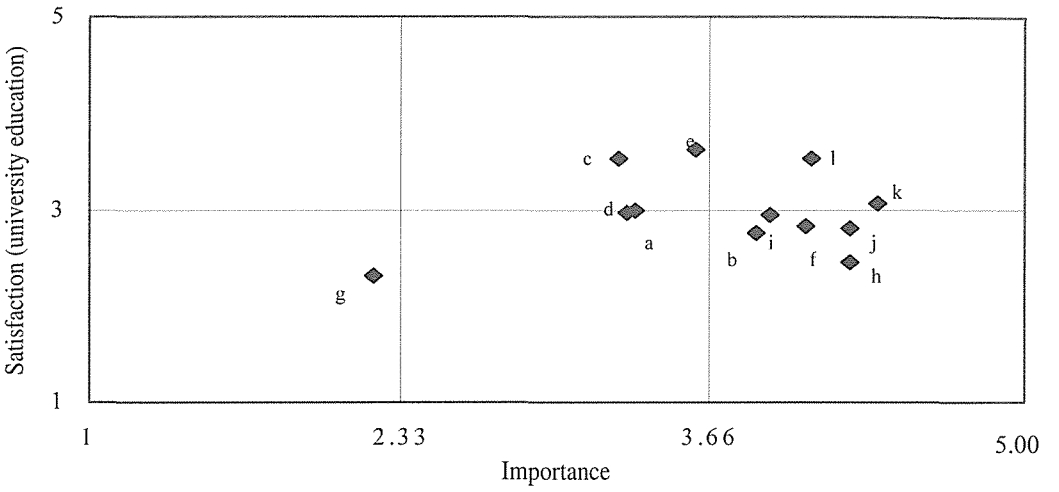
Since the 5th and the 6th categories are classified as important knowledge areas and skills, the knowledge areas and the skills that are in these two categories should be focused mainly on the improvement of quantity surveying education in the future. Figures 2 and 3 indicate that team working skill (l) is considered excellent for quantity surveying graduates, while taking-off skills (h), negotiation skills (j), professional practice knowledge (b) and communication skills (f) fall in the 5th category, thus, rendering improvement necessary. The analytical skills (k) are satisfied by the graduates as shown in figure 3, but still needs urgent improvement in the under-graduate course according to the results shown in figure 2. In contrast, the computation skills of the graduates have risen above the expectations of the industry. This may be due to the innovative information technology available in the market. The practitioners, it seems, cannot afford much time to upgrade their information technology skills.

However, a point must be made regarding the limitations of these results as they relate to the nature of the data that has been collected on perceptions. There is a difference between what people think should be importance /satisfaction and what they make importance /satisfaction for themselves because of the circumstances they face. Therefore, a within-group design was adopted in the two separate main groups (supervisory and graduate) in this study, in order to avoid a perceptive deviation amongst the respondents.



[Note: Knowledge areas and skills (a-l) refer table 2 and 3.]

Figure 2: Comments of the Supervisory Group on the Strengths and Weaknesses of Knowledge Areas and Skills



[Note: Knowledge areas and skills (a-l) refer table 2 and 3.]

Figure 3: Comments of Graduate Group on the Strengths and Weaknesses of Knowledge Areas and Skills

CONCLUSION

Both supervisory and graduate surveyors rank general quantity surveying skills such as taking-off, analytical thinking and team working as the most important skills for surveying graduates. The results indicate that there are only a few different opinions on the importance of and satisfaction with knowledge areas and skills between the employers and the graduates. Both computation skills and team working skills are considered to be strong skills in quantity surveying graduates. However, taking-off skills, negotiation skills, professional practice knowledge, analytical skills and communication skills are classified by the supervisory group as essential and, simultaneously, the weak knowledge areas and skills of quantity surveying graduates. On the job training is now provided by the firms to improve measurement skills. It is suggested that closer collaboration between the industry and the academia would enable improve the toothing of training and needs of the industry.

On the other hand, it is also necessary to review the existing quantity surveying programs in Hong Kong, in order to improve the quantity surveying education in the real educational system. Further research is recommended to investigate the philosophy of quantity surveying programmes in various universities in Hong Kong, the nature of subjects in the programmes and the associated teaching hours for each subject in the programmes.

ACKNOWLEDGEMENT

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IDENTIFYING VALUE-ADDING STRATEGIES IN HONG KONG CONSTRUCTION PROJECTS

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ABSTRACT

Previous researches highlighted Value Chain Management (VCM) as one of effective the management approaches to enhance the competitiveness of the construction industry. This paper reports a study that first identifies the value-adding strategies that can be used in the construction projects. A questionnaire survey was then employed to evaluate their effectiveness. It was found that 'Maintain effective and sufficient communication' is ranked as the most effective strategy among others. From the results of a Principal Component Factor Analysis, value-adding strategies are grouped into four major factors namely: 'Consolidating management systems at the early stage of the project', 'Solutions to enhance and improve parties' performance', 'Effective responses to min?imize risk' and 'Investment for enhancing value chain competitiveness'. This further helps the practitioners to consolidate the value-adding policies in perspective.

Keywords: Value Chain Management, Value-adding

INTRODUCTION

Despite facing greater competition with other Asia and mainland cities, the construction cost in Hong Kong remains the highest compared within the Asia Pacific regions (Gardiner and Theobald 2004) as shown in Table 1.

Country/ Region	City Centre air-conditioned Office	Industrial, Factories, Warehouses	High-rise Apartments	Shopping Centre	High Quality Capital City Hotel
	US$/sq. feet	US$/sq. feet	US$/sq. feet	US$/sq. feet	US$/sq. feet
China	59-88	31-54	35-45	67-99	90-123
Hong Kong	115-151	49-72	101-126	135-153	129-175
India	37-44	29-34	21-30	33-43	99-170
Indonesia	29-45	22-25	32-44	22-25	44-48
Philippines	33-54	20-27	35-59	27-52	42-75
Singapore	91-111	35-50	70-84	70-86	113-178
Thailand	58-70	19-23	51-63	37-49	77-89
Vietnam	74-92	29-37	66-82	54-66	99-123

Table 1: International Construction Cost Survey, 2004 (modified from Gardiner and Theobald (2004))

This causes concerning as high construction cost may make Hong Kong less attractive in view of the local and international developers. Indeed, one of the major reasons causing high construction cost in Hong Kong is the organizational inefficiency of the construction industry (CIRC 2001). In fact, organizational inefficiencies in construction industries have no geographical boundaries (Egan 1998, Vrijhoef R. 1998, Lindfors 2002). As suggested by several construction researchers, implementing new management approaches like Total Quality Management, Benchmarking, Partnering, Supply Chain

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Management and Value Chain Management may found useful in enhancing the competitiveness of the construction industry. Among these management concepts, Value Chain Management (VCM) has received the attention of researchers in recent years due to its perceived benefits to all construction project participants through implementing the successful value-adding strategies (Al-Madimigh et al. 2004). This paper reports a study on identifying and comparing the effectiveness of the value-adding strategies in Hong Kong's construction projects.

VALUE CHAIN MANAGEMENT IN CONSTRUCTION PROJECTS

The concept of VCM was firstly developed by Porter (1985). It was introduced as a competitive advantage paradigm and described as an evaluation process from inception to the completion phase of a production line (Onwubolu et al. 1999). As such, all these phases germinate the seeds of competitive advantage. Through developing and implementing appropriate value-adding strategies, a greater project value will then be delivered and beneficial to all participants in the production line (Porter 1985, Kippenberger 1997). Since then, VCM had become an explicit research area and was evolved to broader views (Govindarajan and Shank 1993, Brown 1997, Lancaster and Walter 2000). Accordingly, there were researchers attempting to develop a VCM model in construction adopting the Porter's model (Kelly et al. 2002, Smith 2002, Chorpa and Meindl 2004). Among them, Chorpa and Meindl (2004) analyzed the construction value chain process by breaking it down into Developer's Order Phase, Procurement Phase and Operational Phase as shown in Figure 1.

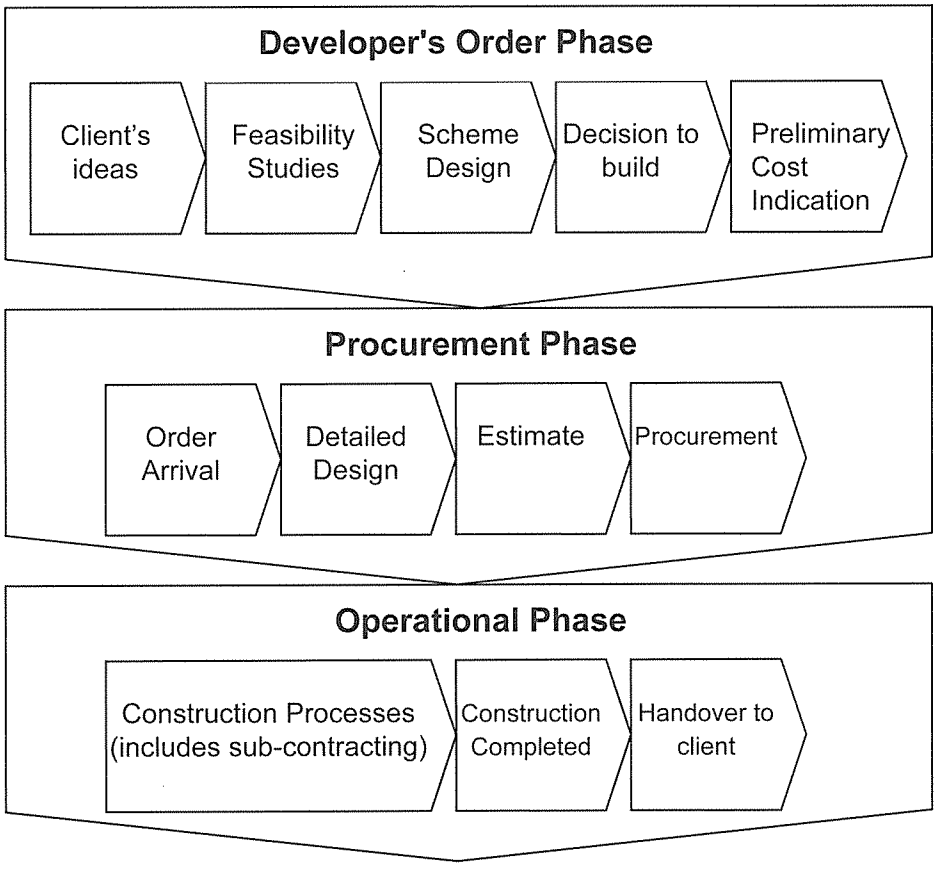

Figure 1: Construction Value Chain (Modified from Chopra and Meindl, 2004, Simth

For a construction development, the value chain originates from the developer's initiative to demand a built object. Through setting out his demands, the developer (or his representative if he is not a construction expert) establishes a construction project organization comprising a scheme design. The associated preliminary indication of building cost will also be prepared (Vrijhoef 1998). These processes are included in the Developer's Order Phase.

After that, the value chain process moves to the Procurement Phase. The engineers and the architects will prepare the detailed design. The quantity surveyors will also prepare a preliminary cost estimate. They will also be consulted to advise the suitable procurement and tendering method. That leads to the award of a contract to a main contractor to carry out the actual construction work though tendering procedures. The main contractor will comply with a production schedule approved by the architect who will provide drawings and information to enable the completion of the construction work (Vrijhoef 1998).

Value-adding strategies	Description	Citation
Understand clients'	The client's needs should be answered in the very requirementbe ginning during brief design based on right first time concepts to provide efficiency and avoid resources wastage or abortive works.	Porter (1985), Kelly et al. (2002)
Avoid using complicated designs and construction methods	Using simple designs made up of standard components or on-site assembly can lead to cost reduction. In ddition, using simplify or astandardised construction process to produce customised solutions to speed up construction.	Porter (1985), Kelly et al. (2002)
Consider operation and maintenance cost before construction	Using life-cycle costing method when deciding the use of construction materials and its installation methods by considering the operation and maintenance cost of them	Porter (1985), Kelly et al. (2002)
Apply tender pre-qualification	Applying tender pre-qualification to select capable contractors and/or suppliers to secure the targeted quality and time	Kelly et al. (2002)
Select appropriate procurement method	Using suitable procurement method to allow the involvement of construction firms in the planning and design stage for overlapping of design and construction time and improving of buildability	Wilkins (1999), Kelly et al. (2002), Masterman (2002)
Facilitate better time management	Carry out effective project management and time management to meet the preset milestone date as stated in the programme	Porter (1985), Barnes (2001), Kelly et al. (2002)
Make prompt decisions and give prompt instructions	Early conformation on design and early instruction on variation to allow advanced planning and avoid abortive works	Porter (1985), Kelly et al. (2002)
Maintain effective and sufficient communication route	Maintaining effective and sufficient communication route among project team members by electronic communication or face-to-face communication, e.g. by meeting, to increase productivity and improve project performance	Chen et al. (1999), Kelly et al. (2002)
Ensure effective information flow	Ensuring effective information flow to enhance mutual understanding on counter part's strengths and difficulties and to facilitate management and organization, so that better performance can be achieved at lower cost	McGuffog and Wadsley (1999), Kelly et al. (2002)
Apply information technology	Applying information technology on giving instructions, confirmations, etc. for more efficient and convenient communication	McGuffog and Wadsley (1999), Kelly et al. (2002)
Employ calibre person	Employing calibre person to management the project so that management system can be implemented efficiently and effectively to save cost and time	McGuffog and Wadsley (1999), Kelly et al. (2002)
Provide training and education	Using modern management techniques and providing training and education to the project team members on these techniques to improve performance of the project	McGuffog and Wadsley (1999), Kelly et al. (2002)
Implement incentive scheme	Implementing performance indicators, incentive or punishment scheme to motivate project team members to improve productivity and quality	Porter (1985)
Implement punishment scheme		
Provide convenience product	Provide convenient and ready for use product by providing large range of after-sale service, such as guarantees, rapid and positive response to defects	Porter (1985), Barnes (2001)

Table 2: Summary of the value-adding strategies in construction

The Operational Phase occurs at the main contractor/developer interface which includes all processes necessary to complete the construction work and hand over to the developer. The main contractor will take charge of the employment of sub-contractors and the procurement of materials according to the planned production schedule. In this phase, the main contractor is responsible to manage the multi-tier sub-contractors and material suppliers. After the completion of construction, the end-product (i.e. the building) will be handed over and used (or sold) by the developer (Vrijhoef 1998).

Capitalizing the competitive advantages offered by the construction value chain, optimizing project values by better management of and facilitate integrations between the working procedures and phases as shown in Figure 2 are required (Smith 2002). Summarizing from various literatures on VCM (Porter 1985, Chen et al. 1999, McGuffog and Wadsley 1999, Wilkins 1999, Barnes 2001, Kelly et al. 2002, Masterman 2002), 15 major value-adding strategies were identified in the construction value chain (Table 2 refers).

The enlisting of the 15 value-adding strategies helps to put the study on VCM in construction in perspective. However, to assist management to direct their effort to foster project success, it is essential to identify first those strategies that are most effective to achieve value-adding purposes. Hence, the first objective of this study is to identify the relative effectiveness of the above 15 strategies in achieving value-adding. Furthermore, in an attempt to make the notion of VCM in construction more amenable for analytical grip, the second objective of this study is to group and interpret these 15 strategies by a smaller numbers of factors (Hair et al. 1998). The factors identified generally could better represent the underlying construct in a concise and interpretable form (Dulaimi et al. 2002).

THE STUDY

To accomplish the research objectives, a postal questionnaire survey was performed for data collection. The questionnaire was designed to solicit the respondents' assessment on the degree of effectiveness of the 15 strategies in achieving value-adding purposes in the construction projects by a seven-point Likert scale (1: not effective, 7: very effective).

The questionnaire consists of 2 parts; Part 1 - Personal information and Part 2 - The effectiveness of the strategies to achieve value-adding purposes. Part 1 aims at soliciting information about the respondent including their working experiences, as well as particulars of the referenced project. Part 2 contains 15 questions. They are designed for revealing the effectiveness of the strategies proposed by the previous literatures in relations to value-adding. Accordingly, the 15 value-adding strategies enlisted in Table 2 were evaluated by the respondents in this context.

The Response Rate

A total of 118 questionnaires were sent to private and public-sector developers, consultant firms and contractor firms. As shown in Table 3, 54 replies were obtained representing a response rate of 45.8%.

	Sent (no.)	Received (no.)	% Received
Developers	6	3	50.0%
Consultants	62	28	45.2%
Contractors	50	23	46.0%
Total	118	54	45.8%

Table 3: Questionnaire sent and received

Both the return rate and sample size were considered reasonably good for this type of study. The return rate for similar studies in Supply Chain Management done by Lo and Yeung (2004) in Hong Kong was based on 30 responses.

Effectiveness ranking of the value-adding strategies

The effectiveness of the 15 value-adding strategies were ranked by their mean scores derived from all

valid responses. If two or more value-adding strategies happened to have the same score, the one with the lower standard deviation will be assigned the higher ranking (Table 4 refers).

Referring to Table 4, the highest mean score is observed from the value-adding strategies 'Maintain effective and sufficient communication' and 'Understand clients' requirement'. The results indicate that the available of sufficient communication route is the most essential strategy for facilitating value-adding in construction projects as perceived by respondents. In addition, understanding the client's requirement is essential too. This finding is reasonable since understanding clients' requirements is the basic step for achieving value adding (Porter 1985). Furthermore, when clients' needs are understood and effective communication is available; the end-product (i.e. the building) delivered would better meet with the client's requirement since the project goals among project team members are aligned all through the construction value chain (Smith 2002). Except 'Implement punishment scheme' (ranked last) had a particular low mean score of 3.75, the rest of the value-adding strategies are having a mean scores lie in a very close range from 4.63 to 4.98. This indicates that the levels of effectiveness of these value-adding strategies perceived by the respondents are very close. This result pattern provides little information for management action and a small difference of their mean scores would cause a noticeable variation of the rankings. In this respect, grouping of these strategies into a smaller number of factors may prove useful. This is because the factors identified could better represent the underlying construct of the similar type of attributes in a more concise and interpretable form (Dulaimi et al. 2002).

Effectiveness Ranking	Value-adding strategies	Mean Scale Rating	Standard Deviation
1	Maintain effective and sufficient communication route	5.27	1.132
2	Understand clients' requirement	5.06	1.205
3	Ensure effective information flow	4.98	1.145
4	Apply tender pre-qualification	4.96	1.160
5	Employ calibre person	4.94	1.192
6	Consider operation and maintenance cost before construction	4.88	1.033
7	Apply information technology	4.86	1.099
8	Select appropriate procurement method	4.81	1.024
9	Facilitate better time management	4.81	1.065
10	Make prompt decisions and give prompt instructions	4.73	1.180
11	Provide training and education	4.72	1.386
12	Implement incentive scheme	4.66	1.451
13	Provide convenience product	4.63	1.167
14	Avoid using complicated designs and construction methods	4.63	1.236
15	Implement punishment scheme	3.75	1.631

Table 4: Effectiveness ranking of the value-adding strategies

Grouping value-adding strategies into smaller number of factors

Principal component factor analysis (PCFA) is an effective tool to factorize a large number of attributes into a smaller number of factors to enhance a more systematic and effective data interpretation (Cheung 1999, Dulaimi et al. 2002). As such, in an attempt to investigate the underlying construct of the 15 value-adding strategies; PCFA was performed by the use of the statistical package of social science (SPSS). To achieve a simpler and pragmatically more meaningful factor solution, VARIMAX rotations were performed

to enhance factor interpretations (Hair et al. 1998). The results of the factor analyses after VARIMAX rotation are presented in Table 5.

Value-adding strategies	Factor			
	1	2	3	4
Consider operation and maintenance cost before construction	.814	-.003	.114	.131
Ensure effective information flow	.717	.263	.136	.270
Maintain effective and sufficient communication route	.714	.341	.188	.127
Apply tender pre-qualification	.649	.297	.362	.058
Implement incentive scheme	-.021	.826	.071	.304
Provide training and education	.328	.777	.042	.098
Implement punishment scheme	.192	.681	.241	-.229
Select appropriate procurement method	.300	.436	.157	.115
Avoid using complicated designs and construction methods	.050	.221	.817	-.083
Make prompt decisions and give prompt instructions	.199	-.053	.755	.027
Understand clients' requirement	.303	.119	.590	.254
Facilitate better time management	.120	.253	.588	.309
Employ calibre person	.155	.104	.130	.797
Apply information technology	.026	.153	.110	.730
Provide convenience product	.290	-.063	-.009	.711
% Variance	17.326	15.878	14.996	14.126
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	0.686			
Bartlett Test of Spericity : *Approx. Chi Square*	254.903			
df	105			
Sig.	0.000			

Table 5: Factor analysis and total variance explained -Value-adding strategies

In Table 5, both results from the Bartlett Test of Spericity (with the significance level of 0.0000) and the KMO Measure of Sampling Adequacy (which is higher than the threshold of 0.500) indicated that the sample data is adequate for factor analysis (Sharma, 1996, Hair et al. 1998, Cheung 1999).

According to the Eigenvalue greater than 1 rule (Sharma, 1996), four value-adding factors are identified after the VARIMAX rotation. The extracted factors explained 63.00% of the total variance, which is considered sufficient to explain the effectiveness of the value-adding strategies using the extracted results.

Four value-adding strategies are extracted as significant in factor 1. They are: Consider operation and maintenance cost before construction, Ensure effective information flow, Maintain effective and sufficient communication route and Apply tender pre-qualification. Referring to the descriptions of these strategies in Table 1, this factor is describing early planning for effective management of the project by considering life cycle cost, determining communication method between all project team members, and implementing selective tendering to select capable contractor. Therefore, these strategies facilitate well planning to prevent time and cost wastage on ineffectiveness of project running. Factor 1 is then interpreted as *'consolidating management systems at the early stage of the project'*.

Factor 2 consists of the strategies; Implement incentive scheme, Provide training and education, Implement punishment scheme and Select appropriate procurement method. Collectively, factor 2 can be interpreted as *'solutions to enhance and improve parties' performance'*.

Avoid using complicated designs and construction methods, Make prompt decisions and give prompt instructions, Understand clients' requirement and Facilitate better time management loaded highly in factor 3. All these strategies concern effective measures to minimize risk. Therefore, factor 3 is interpreted as ***'effective responses to minimize risk'.***

Employ calibre person, Apply information technology, Provide convenience product are the strategies extracted for factor 4. They refer to the investments to enhance project performance for achieving client's satisfaction. Therefore, factor 4 is interpreted as *'investment for enhancing value chain competitiveness'.*

INDICATIONS FROM THE FINDINGS TO THE HONG KONG CONSTRUCTION INDUSTRY

In response to the increasing competitive pressure from the neighbour cities to Hong Kong, construction organizations have to focus on how to improve their efficiency. If fail to do so, Hong Kong may lose its international and regional competitive advantages. As such, the concept of Value Chain Management was seen as a powerful tool for project managers to diagnose and enhance competitive advantages. In the study reported in this paper, views on how to achieve value-adding to the construction projects were examined. In this connection, practitioners' views were first solicited then followed by the statistical treatment of the PCFA.

The survey results suggested that 'Maintain effective and sufficient communication' and 'Understand clients' requirement' are the most effective strategies for achieving value-adding purposes in Hong Kong construction projects. The findings are compatible with Porter (1985) assertion that understanding end users requirements by alignment of project goals among the value chain participants is the basic step for achieving value-adding. In this connection, maintaining effective and sufficient communication is an essential strategy to ensure all project participants are working under the reset project goals to fulfill the client's requirements. 'Implement punishment scheme' is found as the least effective value-adding strategies. Implementing punishment schemes often discourage faithful collaboration among project team members. To avoid being punished, project team members may hesitate to share innovative ideas or alternative construction methods even these may generate better values of the project.

In an attempt to understand the value-adding strategies by an easier interpretable and analytical format, the study suggested that construction practitioners in Hong Kong to achieve value-adding in their projects by the following four major perspectives; 'Consolidating management systems at the early stage of the project', 'Solutions to enhance and improve parties' performance', 'Effective responses to minimize risk' and 'Investment for enhancing value chain competitiveness'.

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