I.T. SURVEY WITHIN THE CONSTRUCTION INDUSTRY OF HONG KONG

U.K.'s construct-I.T. health-check in Hong Kong

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Abstract

This paper presents results taken from a 1998 postal survey of the consulting firms and the contractors of the Hong Kong construction industry. The survey included, as one part of the four-part survey instrument, the 'Health Check of the Strategic Exploitation of I.T.' developed by the UK Centre of Excellence for Construct IT (Betts and Shafagi 1997). This paper present the results of the IT health check for a population sample of three hundred and sixteen contractors and another population sample of two hundred and seven consultant firms operating within the Hong Kong Special Administrative Region of China.

Keywords: construction, information technology, Hong Kong

1 Introduction

This paper presents results taken from current research into the extent that construction IT is used by the contractors and the consultant firms of the construction industry of Hong Kong. The research findings are one element of a postal survey of the contractors on the public works list of contractors, and also one element of a separate postal survey of the consultant firms listed in the Government directories of consultants. The list of the contractors, and the directories of the consultants, are administered by the Government of the Hong Kong Special Administrative Region (HKGSAR) for the competitive and open bidding of public works contracts and assignments.

This paper presents results from a common element of both surveys, namely a questionnaire published in 1997 by Betts and Shafagi and called by them, 'A Health check of the Strategic Exploitation of IT'. It is used to provide a comparative assessment of the strategies of the public works contractors of the

Hong Kong construction industry for the use and deployment of IT: and similarly for the consultant firms that have expressed interest in carrying out public works commissions offered by the HKGSAR. The Betts and Shafagi questionnaire was first used in the UK but has also been used in Australia (Stewart et al. 1998), and in South Africa (Allen 1999). Further use in other countries is useful as it permits benchmarking on an international scale of this aspect of construction-IT.

The first of the two postal surveys is targeted at a population sample of 316 contractors. The sample ranges from small, local, businesses to large, international, companies. The second postal survey is targeted at a population sample of 207 consultant firms. This sample ranges from small, local, businesses to large, international, consultant organisations that use a mixture of offshore and onshore expertise.

2 Postal survey of Hong Kong contractors and consultants

The method developed by Betts and Shafagi is a self-assessment questionnaire of twenty-eight questions that companies answer to assess their use, and their management, of IT. The questions are grouped into three categories:

- the position of IT within the competitive business strategy of the organisation *(7 questions)*;
- the overall role of IT within the organisation *(5 questions)*; and
- the current IT strategy within the company *(16 questions)*.

The approach is useful to the companies who participate in the survey, because it gives them an instant feedback on their strategy and policies for the use of IT compared to a benchmark standard developed in the UK for this purpose. It is also useful to the researcher as it provides a basis for comparison with research exercises using the same survey instrument that have been carried out elsewhere. Or in this Hong Kong case: one sector of the industry compared to another. It should be noted that the questions in the health check are qualitative and not quantitative. The responses are useful indicators of the construction industry's self regard for the strategic importance of IT.

2.1 Analysis methodology

Scoring for each question is consistent with the method used by Betts and Shafagi, and adopted by Allen, and also by Stewart to enable international comparisons to be made. Answers are given a score of 1 for a 'D', 2 for a 'C', 3 for a 'B' and 4 for an 'A'. For the purposes of later analysis: a mean score between 0 and 1, is considered a 'D'; a mean score between 1 and 2 is considered a 'C'; a mean score between 2 and 3 is considered a 'B'; and a mean score between 3 and 4 is considered an 'A'. A small number of participants were unable to complete all of the questions in the health check. To remove any bias in the results, the entire response from these participants was removed from the data analysis. The remaining responses were analysed, and the arithmetic mean, median, and mode for each of the questions; for the three groups of questions; and for all the questions in the survey were calculated. In these same combinations,

statistical attributes were calculated to indicate the frequency distribution and the variability within the sample. The overall result for each company was correlated to the number of employees in the company. Results were also separated into those companies who had ISO9000 certification and those who did not. This enabled a side by side comparison of results to indicate a possible relationship between quality assurance and strategic use of IT. In addition the results were also analysed for certain sectors of the population sample.

In keeping with the qualitative nature of the survey, the categorisation of the overall grading derived from the analysis is: A means 'IT innovative'; B means 'IT active'; C means 'IT aware'; and D means 'IT unconcerned'.

3 Survey of contractors

3.1 Sample population

The sample population is taken from the list of approved Contractors, kept by the Professional Services Unit of the Works Bureau of the Government of Hong Kong. Their Technical Circular No 9/1997 (http://www.wb.wpelb.gov.hk/circular/index.htm) describes the HKGSAR rules for admission to the list. This is primarily a pre-qualification process which, when satisfied, allows a Contractor to submit a tender bid for the construction of public works projects. The Contractors are grouped according to their proven track record and their ability to finance construction. The groups are Group A, Group B, and Group C. Each group is able to tender for public works contracts whose value falls within certain limits which are periodically adjusted by the HKG. For example, Group A contractors are eligible to tender for contracts not exceeding HK$ 20 million, Group B can bid for contracts up to $ 50 million, whereas Group C contractors can tender contracts of any value.

The Contractors are approved within one or more, of five categories of public works. These are: buildings (BD); port works (PW); roads and drainage (RD), site formation (SF), and water works (WW). The suitability of a contractor for inclusion in one or more of the categories and a particular group is assessed from the contractor's global business activity and construction activity in Hong Kong.

The approval assessment considers financial criteria, technical and management capabilities, and general evidence of being suitable to tender for public works projects within a group and for certain categories. There is not a requirement that Contractors must be of a minimum size of company. The nature of construction and the high degree of sub-contracting that takes place in construction in Hong Kong make this an imprecise measure of the capability of a company. However, it is a requirement that they employ in Hong Kong, a minimum number of full time management and technical personnel with relevant experience and recognised qualification in engineering and project management. A holding company and its subsidiaries can be included in the Contractors List, however they must give an undertaking that only one company will tender for one contract.

The Works Bureau of HKGSAR provided a set of data taken from their computerised list of public works contractors. The population sample from this

list is 829 general contractors, 1636 if it included specialist contractors. The list was culled to remove specialist contractors who operate within a field so narrow that it does not represent the industry in general. Companies not registered in Hong Kong or joint ventures were also taken out of the population sample. The attributes of the culled Contractor population sample are itemised on Table 1. One company went into liquidation, resulting in population sample for the postal survey of 316 contractors.

Table 1: Attributes of the contractor population sample in general

Attribute of the population sample
Of the 317 Contractors in the population sample, 317 (100%) are listed in terms of Category and Group.
Of the 317 Contractors in the population sample, 125 (39%) have ISO 9000 certification.
Of the 129 Group C Contractors in the population sample, 103 (80%) have ISO 9000 certification.
Of the 88 Group B Contractors in the population sample, 15 (17%) have ISO 9000 certification.
Of the 100 Group A Contractors in the population sample, 7 (7%) have ISO 9000 certification.
Of the 129 Group C Contractors in the population sample, 21 (16%) are approved for all five Categories of public works.
(2 Group B Contractors also have five Categories, 0 Contractors are in Group A.)

3.2 Postal release of the questionnaire

The questionnaire was posted to the sample population on Saturday, February 28, 1998. The postal distribution followed commonplace rules to encourage participation. The deadline set for receipt of response was March 20, 1998. The percent level of response was measured and a list of responses created. Reminders were then issued and the registration process repeated for the second round of responses. A second reminder letter was sent out to remaining companies who had not responded. This reminder included a further copy of the questionnaire.

3.3 Results from the Hong Kong contractors

By May 8, 1998, 238 questionnaire responses were received. Incomplete responses to the health check survey reduced this to 194 for analysis. The 61% response is good for this type of survey. Average scores from each of the 28 questions, for the three major sections, and the responses overall were calculated using the marking methodology described in Section 2.1. The marks achieved are compared to the range of marks possible. For example, the range of marks in each of the question-sections, are: 0-28 marks for 'competition and business strategy; 0-20 marks for the 'role of IT'; 0-64 marks for 'IT strategy'; and 0-112 marks for the questions 'overall'.

Distribution statistics were computed, including standard deviations to measure the variability within the sample. These are listed in Table 2 to show the results for all respondents and the results for the A, B and C groups of companies, and also for companies with ISO9000 certification and those without certification.

The values at the higher end of each range indicate a higher priority is given to that aspect of IT within that sample sector.

Table 2: Statistical results from the Hong Kong postal survey of 194 contractors

All ***(194 contractors)***	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	9	17	16	17	3.38
Role of IT	19	5	10	10	11	2.68
IT Strategy	63	16	33	30	34	8.43
Overall	101	32	61	60	62	13.08
Group A ***(55 Contractors)***	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	9	17	16	16	3.41
Role of IT	19	5	10	10	10	3.01
IT Strategy	63	16	30	36	32	8.59
Overall	101	32	57	39	58	13.56
Group B ***(59 Contractors)***	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	24	11	17	16	17	3.15
Role of IT	15	5	11	11	10	2.29
IT Strategy	53	20	33	37	33	7.24
Overall	92	39	61	51	61	11.31
Group C ***(80 Contractors)***	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	9	17	16	18	3.4
Role of IT	19	6	11	10	11	2.64
IT Strategy	56	16	36	30	36	8.59
Overall	97	35	63	60	65	13.14
Contractors with ISO certification *(89 companies)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	12	18	16	18	3.24
Role of IT	18	7	11	10	11	2.4
IT Strategy	56	16	35	30	36	8.07
Overall	89	30	63	63	63	12.38
Contractors without ISO certification *(105 companies)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	9	16	16	16	3.31
Role of IT	19	5	10	10	10	2.83
IT Strategy	63	16	32	37	32	8.44
Overall	101	32	58	51	59	13.25

Table 3 contains the results of a check for correlation between number of employees in the company and the sections of questions in the healthcheck survey.

Table 3: Correlation between number of employees of the firm and the IT health check

All Groups *(194 Contractors)*	**Correlation**	**Comment**
Competition and Business Strategy	0.17	No correlation
Role of IT	0.17	No correlation
IT Strategy	0.16	No correlation
Overall	0.18	No correlation

4 Survey of consultant firms

4.1 Sample population

The sample population is taken from the directory of approved consultants kept by the Architectural and Associated-Consultants Selection Board (AACSB) and the Engineering and Associated-Consultants Selection Board (EACSB) of the HKG. Being listed on these directories is not a pre-qualification exercise. It merely means that these companies have expressed an interest in performing government commissions. The two directories are to meet the needs of the AACSB and the EACSB. They are different in style and content.

The AACSB directory contains 96 companies who have registered an interest in providing up to five categories of professional services. There is marked differentiation among these companies with most being registered in a single category. Only 6% of the companies are registered in two categories, and 3% in three categories. All of the companies in the directory are registered as companies in Hong Kong. The attributes of the AACSB information supplied by the Secretary to the AACSB are listed in Table 4. All of the AACSB companies are included in the consultant population sample.

Table 4: Attributes of the population sample supplied by the AACSB

Data attribute	Comment
Code	Unique 6 letter identifier
Company name	
Company address	Hong Kong addresses
Telephone	
Fax	
Companies in each category.	17 No. Building Services Co. 35 No. Architectural Co. 15 No. Quantity Surveying Co. 9 No. Landscaping Co. 32 No. Structural Engineering Co.
Percent of the companies in each category, which are ISO9001, certificated. (77 companies in the population sample (80%) are certificated)	100% Building Services o. 83% Architectural Co. 100% Quantity Surveying Co. 33% Landscaping Co. 75% Structural engineering Co.
No of consultants providing for multiple services	0 No for 5 services 0 No for 4 services 3 No for 3 services 6 No for 2 services
Population sample from AACSB	96 companies

The EACSB directory contains a profile of 347 companies who have registered an interest in providing up to 18 categories of professional service plus a variety of 'other' services. The EACSB directory includes companies registered in Hong Kong and companies operating from overseas. The EACSB directory is more comprehensive than the AACSB. Some of the listed companies provide services that are borderline to the construction process. Works Branch Technical Circular 1/95 (http://www.wb.wpelb.gov.hk/circular/index.htm) explains the use of this directory. It identifies a broad list of consultants for initial consideration for

an assignment. Criteria for registration on the directory are not stringent. Culling the EACSB list to remove those companies without a Hong Kong address, or those whose primary business is not construction, results in a population sample of 159 companies. 75% of the population sample register as having expertise in two or more of the categories, 51% are in five or more categories, and 24% are in twelve or more categories. This is evidence that the majority the EACSB consultants are multi-discipline practices. Their response to the questionnaire will reflect the broad nature of their multi-discipline practices and not the special procedures needed for specific professional services. For these reasons the 18 categories of EACSB consultants are placed in the one, multi-discipline category of civil engineering named 'civil'.

The two populations are combined to form the Consultant Population Sample described in Table 5.

Table 5: Data items within the Consultants Population sample

File	Field data	Field attribute
Consultant_pop_sample *207 records*	CONTRACTOR_REF	Company unique reference code
	COMPANY	Name of company
	NAME	Contact person
	CONTRACTOR_ADS	Contractor's address in Hong Kong
	CONTRACTOR_PHONE	Contractor's telephone number
	CONTRACTOR_FAX	Contractor's fax number
	BUILDINGSERVICES	Category of professional service
	STRUCTURAL	Category of professional service
	ARCHITECTURAL	Category of professional service
	LANDSCAPE	Category of professional service
	QUANTITY SURVEY	Category of professional service
	ENGINEERING	Category of professional service
	ISO	Yes if certificated.

The resultant sample size is 207 companies. Table 6 lists their attributes.

Table 6: General attributes of the Consultants Population sample

Attribute of the population sample
❑ Of the 207 Consultants in the population sample, 154 (74%) are taken from the EACSB directory.
❑ Of the of the 154 EACSB Consultants in the population sample, 60 (39%) have ISO 9000 certification.
❑ Of the 96 AACSB Consultants in the population sample, 77 (80%) have ISO 9000 certification.
❑ Of the 207 Consultants in the population sample, 100 (48%) have ISO 9000 certification.

4.2 Postal release of the questionnaire

The questionnaire was mailed to the sample population on February 27, 1998 so as to arrive on March 2, 1998. The process followed the rules used for the contractor postal survey.

4.3 Results from the Hong Kong consultant firms

By May 8, 1998, 147 questionnaire responses were received. Incomplete responses to the health check survey reduced this to 126 (61%) for analysis. Analysis is the same as the Contractor survey described in Section 3.3. Statistics are listed in Table 7 to show the results overall and for the four population sectors

that have a response of at least 15 firms. Also shown are the results for companies with ISO9000 certification and those without certification.

Table 7: Statistical results by population sector of the Hong Kong consultant firms

All *(126 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	13	20	19	20.4	3.3
Role of IT	20	5	13	12	13.2	3.2
IT Strategy	62	22	41	41	40.6	9.2
Overall	106	43	74	70	74.1	14.4
Architectural sector (*25 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	14	19	19	19.3	3.5
Role of IT	20	5	13	13	12.8	3.8
IT Strategy	56	22	37	37	36.4	9.1
Overall	102	45	68	86	68.6	14.7
Civil sector *(83 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	14	21	20	21	3.1
Role of IT	19	6	14	12	13.7	2.9
IT Strategy	62	25	42	41	42.6	8.5
Overall	106	47	77	89	77.3	13.2
Structural sector *(24 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	14	20.5	20	20.7	3.7
Role of IT	20	5	13	17	12.7	3.9
IT Strategy	56	22	43	56	41.4	10.4
Overall	102	45	77.5	76	74.8	16.8
QS *(15 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	23	13	19	19	18.8	3.0
Role of IT	16	5	11	10	11.13	3.4
IT Strategy	56	22	30	-	37.3	10.2
Overall	95	43	70	70	67.3	15.4
Consultants with ISO certification *(81 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	13	20	19	20.4	3.3
Role of IT	20	5	13	12	13.0	3.5
IT Strategy	62	22	41	41	40.6	9.7
Overall	106	43	61	61	74.0	15.1
Consultants w/o ISO certification *(45 firms)*	**High**	**Low**	**Median**	**Mode**	**Mean**	**SD**
Competition and Business Strategy	26	14	20	22	20.4	3.4
Role of IT	18	8	13	12	13.6	2.7
IT Strategy	56	22	41	41	40.5	8.4
Overall	97	46	74	86	74.3	13.3

Table 8 contains the results of a check for correlation between the number of employees in the company and the sections of questions in the healthcheck survey.

Table 8: Correlation between the number of employees of the firm and the IT health check

All Groups *(126 Consultants)*	**Correlation**	**Comment**
Competition and Business Strategy	0.24	No correlation
Role of IT	0.12	No correlation
IT Strategy	0.17	No correlation
Overall	0.19	No correlation

5 Conclusions

A side-by-side comparison of the overall results in terms of grading is in Table 9. To introduce more sensitivity into the differences a +ve or –ve suffix, or mid-point grading is added to better indicate intermediate positions. The question-by-question strengths and weaknesses of the overall results from the contractors vis a vis the consultant firms is shown in Table 10.

Table 9: Comparison of the surveys carried out in Hong Kong in terms of qualitative grading

Hong Kong Survey	High	Low	Median	Mode	Mean	SD
Survey of 194 contractors	A+	C-	B-	B-	B-	13.08
Survey of 126 consultant firms	A+	C	B+	B	B+	14.4

Table 10: Question-by-question graded performance of Hong Kong contractors (ß) and consultant firms (Ø)

Question	IT unconcerned D	IT Aware C	IT active B	IT innovative A
IT support of core competencies.			ß Ø	
How IT helps company compete.			ß Ø	
Impact of IT on goals and objectives			ß Ø	
Position of IT compared to others.			ß Ø	
Impact of IT on Clients.			ß	Ø
Belief that IT expertise wins work.			ß Ø	
Use of IT as part of strategic alliances.		Ø	ß	
Current use of IT in the company.			ß Ø	
Relationship between IT and business strategy			ß Ø	
Participation of IT in forming business strategy		ß Ø		
Impact of IT on operational strategy.			ß Ø	
IT influence on marketing strategy		ß Ø		
Use of IT systems in company		ß Ø		
Objectives of IT strategy.		ß Ø		
Thrust of IT strategy			ß Ø	
Management of IT in the future		Ø	ß	
CSF's for competitive advantage through IT		Ø	ß	
Management of IT projects and innovation.			ß Ø	
Level of R&D in IT		ß Ø		
Nature of IT department.	Ø	ß		
Importance of IT skills in company.		ß Ø		
Awareness of IT strategy.		Ø	ß	
Involvement of Users in IT strategy.		Ø	ß	
Risks associated with IT strategy.		ß Ø		
Periodic review of IT strategy.			ß	Ø
Measurement of IT performance.			ß Ø	
Characteristics of IT strategy.			ß	Ø
Who champions IT in the company?			ß	Ø

The median, mode, and the mean statistics show a higher degree of IT activity by the consultant firms than the contractors. Those contractors who have a quality assurance certification are more active then those without certification. The opposite occurs among the consultant firms.

The results overall also indicate that the Group C Hong Kong contractors, who are approved for public works projects in excess of HKD $50 million, perform moderately better in the assessment than Group B and Group A. The comparison of results for the population-sectors in the population-sample of consultant firms place the civil engineering sector as the most IT active in terms of highest mode and mean values. Structural engineers are second in terms of highest mean and are highest in terms of median value. Architecture is ranked third and the Quantity Surveyor sector is fourth.

In terms of each of the 28 questions, the Hong Kong contractors were assessed to be 'IT active' in 71% of the questions, and 'IT aware' in the remaining 29% of the questions. The consultant firms were assessed as 'IT innovative' in 14% of the questions; 39% 'IT active', 43% 'IT aware'; and 4% 'IT unconcerned.

In general, the assessment is that the Hong Kong contractors are 'IT active' in most aspects other than including IT in the formulation and delivery of the business strategy and in the marketing strategy. They are 'IT aware' of the use and thrust of the IT and that it is aligned with the goals and objectives of the company; the need for R&D, IT staffing, expertise and skills. Possibly for these reasons, the risks associated with IT are perceived as financial, or technical, and not business or strategic risks.

In comparison, the general assessment is that IT use by the Hong Kong consultant firms is more varied. They are 'IT innovative' with regard to: the impact of IT on clients; periodic review of strategy; characteristics of IT strategy; and champions of IT strategy. They are 'IT active' or 'IT aware' for the majority of the questions but 'IT unconcerned' on the nature of the IT department. The risks associated with IT are perceived as financial, or technical, and not business or strategic risks.

The qualitative evidence gained indicates that the extent of the strategic use of IT by the Hong Kong contractors and by the consultant firms is they are 'IT aware' and 'IT active' but not 'IT innovative' at this time.

6 References

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