Effectiveness of Construction 21: Enhancing Professionalism in Singapore's Construction Industry

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Abstract

The Construction 21 report (C21), prepared by a government-appointed high-level committee, aimed to transform the construction industry in Singapore from a Dirty, Demanding and Dangerous (3D) industry to a Professional, Productive and Progressive (3P) industry. To achieve this intended transformation, the report proposed 39 recommendations under six strategic thrusts. Specific targets were set under each recommendation. The report was adopted as a blueprint for developing Singapore's construction industry, and most of the recommendations have been implemented.

A research project was undertaken to review the effectiveness of C21. This paper reports on a segment of the study; it focuses on the first strategic thrust of C21, which was to raise the level of professionalism in the construction industry. A questionnaire-based survey of the main stakeholders of the industry, including clients, consultants and contractors, was undertaken. On the whole, the change programme was viewed by the respondents to be only moderately effective. The industry considered the programmes for enhancingd the level of professionalism in Singapore's construction industry to be the most effective among the six thrusts. The findings also indicate that all the groups of stakeholders are of the view that more needs to be done. Moreover, despite the many improvements which have been realised, the image of the industry has not been much improved.

Keywords: **Construction 21, industry improvement, change programme, professionalism**

1. Introduction

In Singapore, the initial mandate of the Construction 21 Steering Committee was appointed by the Ministry of Manpower (MOM) and Ministry of National Development (MND) to conduct a thorough investigation into many key aspects of the construction industry, from Processes (including practices, techniques, and integrated approach to construction) and Players (including professionalism and skills) to Products (including the exporting of construction expertise). (Construction 21 Steering Committee, 1999). The Committee proposed the

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following vision for the Singapore construction industry: “To be a World Class Builder in the Knowledge Age”. It suggested that this would involve a change in public perceptions of the industry from a Dirty, Demanding and Dangerous (3D) industry to a Professional, Productive and Progressive (3P) industry (Construction 21 Steering Committee, 1999).

The C21 Steering Committee made 39 recommendations under six strategic thrusts. The thrusts were: (i) enhancing the professionalism of the industry; (ii) raising the skills levels; (iii) improving industry practices and techniques; (iv) adopting an integrated approach to construction; (v) developing an external wing (i.e. building up a strong capability to export construction services); and (vi) a collective championing effort for the construction industry (Construction 21 Steering Committee, 1999). The Building and Construction Authority (BCA) (a statutory agency for developing the construction industry, set up in 1984) was identified as the champion agency. Some of the tasks were also assigned to the Construction Industry Joint Committee (which embraces all the professional institutions and trade associations in construction).The report highlighted the following desired outcomes: (i) a professional, productive and progressive industry; (ii) a knowledge workforce; (iii) superior capabilities through synergistic partnerships; (iv) integrated process for high buildability; (v) contributor to wealth through cost competitiveness; and (vi) construction expertise as an export industry.

The C21 report has been used as a blueprint to develop the construction industry in Singapore (Ofori, 2002). The proposals in the C21 report have been used to formulate action programmes for, and to manage, the industry since 1999, and many achievements have been realized. Examples include: (i) information and communication technology (ICT) adoption, stimulated by the need to submit building proposals on-line through the Construction and Real Estate Network (CORENET) and to submit tenders via the government’s business portal, GeBiz; (ii) greater consideration of buildability during design as a result of statutory minimum levels; (iii) the widespread adherence to the construction quality programme; and (iv) greater recognition of continuing professional development.

The literature relating to the C21 report was published in the first few years after publication of the report. The studies evaluated the programmes and focused on the factors and strategies to enable implementation of the recommendations (Ofori, 2002; 2003; De Silva *et al.*, 2004; Dulaimi *et al.*, 2004). However, there has not been any comprehensive evaluation of the level of success of the implementation of the change agenda. The premise of the research is that, some ten years after the publication of the C21 report, it is pertinent to evaluate the progress made, in order to assess its achievements and the continuing challenges facing the industry. The main objective of the study is to ascertain and evaluate against their original objectives, the outcomes from the implementation of the construction industry performance improvement programmes in Singapore since 1999. This paper reports on the segment of the research project which relates to Strategic Thrust One of the C21 report: “Enhancing the professionalism of the industry”.

2. Enhancing professionalism in the industry

2.1 Professionalism at individual level

The C21 report recommended that the curricula of programmes on construction at the tertiary institutions should be restructured. Common modules for engineering and architecture students should be introduced in order to develop multi-disciplinary skills in students, and build a foundation for future co-operation among them. Following this recommendation, at the National University of Singapore (NUS), for example, common modules were introduced in the curricula for the first degree programmes in Architecture, Building and Real Estate. The report also recommended that soft skills, such as professional ethics and management skills, be included in the educational curricula of construction-related programmes at the in the tertiary institutions. Again, at the NUS, soft skills were included as a part of the curriculum for the engineering, building and architectural students.

Another C21 report recommendation was that the universities and polytechnics should collaborate with the professional institutions and BCA to design academic programmes and training courses which meet the needs of the industry, and attract more professionals to attend these courses. New training programmes for professionals and technicians have been introduced by the professional institutions and trade associations such as the Singapore Contractors Association Limited (SCAL) and Singapore Institute of Surveyors and Valuers (SISV). Some of the institutions have set up their own academies. They often collaborate with the academic institutions to provide courses for professionals. In 2007, the then Construction Industry Training Institute (CITI), the training arm of BCA which undertook trades training, was re-structured with an expanded scope of professional education, and renamed as the "BCA Academy of the Built Environment". The academy offers short courses and executive development programmes, as well as a number of diploma, first degree and master's degree programmes (the latter in partnership with overseas universities).

2.2 Professionalism at professional body/trade group level

The C21 report recommended that Continuing Professional Development (CPD) programmes should be made mandatory for the renewal of professional and trade membership. In Singapore, the law requires architects and engineers to be registered before they can practice as professionals. Prior to the C21 report, BCA had initiated a study on CPD for architects and engineers, together with the two professional registration boards, the Board of Architects (BOA) and the Professional Engineers Board (PEB).

The professions have responded to the C21 report recommendation. Participation in CPD programmes was made mandatory for the renewal of practicing certificates by the Board of Architects and Professional Engineers Board. Previously, Singapore Institute of Architects (SIA) and Institution of Engineers Singapore (IES) had encouraged their members to undergo CPD on a voluntary basis. Since 2003, all licensed architects must obtain 20 Credit Points in order to renew their practising certificates annually, with relevant reductions for those above 60 years old (SIA, 2009).

As examples of the professions not subject to statutory control, the Singapore Institute of Planners (SIP) and SISV require their members to attend minimum numbers of hours of CPD in order to maintain their memberships. Since 2006, members of SIP are required to attain a minimum of 20 CPD points over a period of two years for assessment (SIP, 2007).

SISV believes that CPD enables members to stay ahead with developments in the profession (SISV, 2005). Instead of points, SISV requires its members to record the number of hours of participation in CPD activities, and members must attend 60 hours of CPD activities over three years.

2.3 Professionalism at industry level

At the industry level, the C21 report recommended that professionalism can be achieved through the giving of awards, development and application of information technology (IT), and licensing of builders.

BCA recognises to companies and practitioners by giving four kinds of awards (BCA, 2010): (i) Built Environment Leadership Award recognises outstanding industry firms demonstrating excellence and leadership in shaping a safe, high quality, sustainable and friendly built environment in Singapore; (ii) Construction Excellence Awards acknowledges projects on which the participating teams have attained high standards of management, technical expertise, and workmanship; (iii) Green Mark Awards for buildings with high performance in energy efficiency, building management, water conservation, indoor environmental quality, and environmental protection in a building; and (iv) Green and Gracious Builder Award for builders addressing environmental and public concerns arising from construction works, hence enhancing the image of the industry.

The C21 report recommended that the level of application of IT in construction be raised to help re-engineer the work processes in the industry. The goal of the *Construction and Real Estate Network* (CORENET) is to "re-engineer the business processes of the construction industry to achieve a quantum leap in turnaround time, productivity and quality." The development of CORENET was accelerated following publication of the C21 report. CORENET became a major IT initiative led by the MND and driven by the BCA in collaboration with other public and private organisations. The government committed itself to invest S$44 million to develop the infrastructure after C21 (*Framework*, 1999). One of the first steps was to revamp the website to make it more user-friendly. Next, the One-Stop Submission Centre (OSSC) was developed immediately after C21 and was to be ready in 2001 (*Framework*, 1999). The OSSC enabled the industry to submit planning and building plan applications on-line, and also make submissions for structural designs, temporary occupation permits, certificates of statutory completion and fire safety certificates. The submitted information would be validated, and routed to the relevant authorities or applicants for processing or action. Costing some S$7.7 million, the OSSC brought about savings in manpower, material and time in dealing with the 13 building and planning authorities.

CORENET has undergone a number of development phases. Currently, the effort is focused on developing a set of infrastructure and industry projects in order to: (i) provide information services to allow businesses to speed up business planning and decision making processes; (ii) provide government to business infrastructure to facilitate electronic building plans submission, checking and approval processes; and (iii) provide a set of standards to improve business communications. The CORENET project has been a success story that is inspiring similar developments in other countries. In 2008, Singapore was ranked by the World Bank

as the top economy globally in terms of the ease of doing business (IFC, 2008). CORENET was highlighted as one key reforms that sped up the process for dealing with construction permits, reducing the time from 102 days to 38. Almost 99% of applications are now submitted through CORENET.

BCA and other public agencies such as SPRING Singapore and Singapore Workplace Development Authority, offer several incentive schemes to assist construction companies to deepen the application of IT, such as the Investment Allowance Scheme (IAS), Training Assistance Scheme (TAS) and Local Enterprise Technical Assistance Scheme (LETAS) (BCA, 2010). BCA, together with the Industry Foundation Classes (IFC) Implementers Work Group (IIWG) of buildingSMART Singapore Singapore), have been promoting the use of building information modeling (BIM) as the platform to facilitate the integration of knowledge in design and construction, and handing over to facilities management.

The C21 report recommended that all contractors (including sub-contractors) should be licensed in order to improve their standards and professionalism. In 2005, it was announced that a licensing scheme for contractors would soon be launched (Mah, 2005). To be licensed, firms must be financially sound; have good safety records; and employ qualified and experienced personnel to manage the firm and supervise its construction works. The licensing started on 16 December 2008, with the coming into effect of Part VA of the Building Control (Amendment) Act 2007 on Licensing of Builders. There was a six-month grace period for builders to apply for the license. All builders who have been granted or to be granted a permit to carry out building works, as well as builders carrying out work in six specialist work areas,must possess a license issued by the Commissioner of Building Control (*Pillars*, 2009).

3. Research method, sample and response

3.1 Interviews

Nine in-depth, face-to-face, interviews were conducted with 12 key construction practitioners (from the public and private sectors) as shown in Table 1. The interviews were intended to gain a better understanding of the C21 process and the implementation of the C21 report, from the practitioners and administrators who were involved in the preparation of the report, or have been active in the implementation of its recommendations. The knowledge gained in the interviews would enable the questionnaire for the survey to be drafted.

Table 1 Profile of interviewees.

Interviewee	Position	Organisation type
1A 1B	Director Deputy Director	Government
2	Executive Director	Consultancy firm
3	President	Professional body
4A 4B 4C	President and Chief Executive Officer (CEO) Executive Vice President Executive Vice President	Consultancy firm
5	Chairman	Consultancy firm
6	Past President	Professional body

7	General Manager	Developer
8	Executive Director	Trade association
9	Deputy Director	Government

After a review of the literature relating to the C21 process, lists of questions (based on the strategic thrusts of C21) were prepared to guide the interviewers and interviewees. The interview questions sought to find out the interviewees' perceptions towards the C21 report in general. They were mainly asked to comment on the relevance of C21 in the present context and whether it was necessary to refresh the reform programme. They were also asked for their perceptions of the results of the C21 recommendations, in terms of the progress of the process of transformation and its achievements.

3.2 Questionnaire survey

The survey questionnaire sought to ascertain how senior personnel in Singapore's construction industry would rate the effectiveness of the various initiatives based on the 39 C21 recommendations. A five-point Likert scale was used. The respondents were requested to indicate the level of familiarity with, the effectiveness of, their agreement with, and the necessity of, the various statements, as relevant. For example, when respondents were asked to rate each of the statements on the effectiveness of a measure based on the recommendations, 1 represented "very effective", 2 stood for "effective", 3 indicated "neutral", 4 represented "not effective" and 5 stood for "not effective at all".

Three groups of respondents were identified. They were: clients, consultants and main contractors. Two groups of clients were identified: public-sector clients and private-sector property developers. The public-sector clients were selected on the basis of the relevant portfolio of the particular organisations. The private-sector property developers were selected from the list of members of the Real Estate Developers Association of Singapore (REDAS). A total of 174 clients were selected, as shown in Table 2).

Table 2 Distribution of questionnaires and response rates

Respondent	Sent out	Wrong addresses	Sub total	Usable responses	Response rate
Clients (public and private)	174	18	156	22	14.10%
Architectural firms	337	2	335	45	13.43%
Quantity surveying firms	44	1	43	11	25.58%
Engineering firms	143	7	136	29	21.32%
Main contractors	1,671	11	1,660	150	9.04%
Total	2,369	39	2,330	257	11.03%

The consultants, consisting of firms of architects; structural engineers, mechanical and electrical engineers (M&E) (grouped together as "engineering firms"); and quantity surveyors, were identified from lists published by SIA, Association of Consulting Engineers of Singapore (ACES) and SISV respectively. Some 524 consultants were selected.

The target population for main contractors was drawn from companies registered with the BCA under registration heads CW01 (general building) and CW02 (civil engineering). The

contractors are classifieds by tendering limits into A1, A2, B1, B2, C1, C2 and C3. The smallest firms, C3 contractors, can bid for projects of value no more than S$650,000 (US$494,000). A1 contractors are the largest firms; they are allowed to bid for projects of any size. A total of 1,671 contractors were identified.

Within two months of sending out some 2,369 questionnaires, 267 hard copy questionnaires were returned. Of these, 39 were returned because the firms have changed their addresses. Two questionnaires were not used because they were substantially incomplete. In total, 226 usable responses were received in hard copy format. In addition, 31 firms filled up the online version of the questionnaire. In total, 257 responses were usable, reflecting a response rate of 11.03% (Table 2).

The majority of the respondents were holding senior positions, such as managing directors, directors, partners, Chief Executive Officers (CEOs) and chairmen, which were defined as upper management. Upper management was accounted for 58.77% of the respondents. The middle management level, which comprised general manager, project manager, contracts manager, operation manager, business development manager, and administrative manager, was accounted for 28.51% of the respondents. The professionals, which included engineers, quantity surveyors and architects, accounted for 10.96% of respondents. Administrative staff formed 1.75% of the respondents. Most respondents (79.82%) have worked for more than ten years. This means that they had been working in the industry during the implementation of the initiatives in the C21 report. The high number of senior people with many years of working experience responded to the questionnaire gave validity to the survey results. These factors made the questionnaire ratings dependable, and the views expressed by the respondents noteworthy.

There were 85 responses from the consultants. Of these, more than half (52.94%) were architectural firms, 18.82% were civil and structural engineering firms, 12.94% were quantity surveying firms, 9.41% were multi-disciplinary firms and 5.88% were M&E engineering consultancies. The number of staff of companies ranged from one to 420 (in a multidisciplinary firm). Most consultants responding to the survey were small firms employing one to ten persons. The turnover of the consultants ranged from S$30,000 to S$40 million.

Of the 150 contractors who responded to the questionnaire-based survey, only 135 contractors filled up their BCA grades. Of these, the C3 category took up 41.48%. A1 and A2 contractors accounted for 8.15% and 2.22% respectively. Among the 143 contractors who provided information about the number of staff, 84.51% employed 100 persons or less. The largest contractor employed 1,300 staff. Average turnover was S$22.98 million, with turnover ranging from S$80,000 to S$600 million.

3. Analytical methods applied

Reliability of the questionnaire was examined to determine internal consistency; which is whether all items in the questionnaire measured the same thing. Cronbach alpha (α) is a measure of reliability; it typically varies between 0 and 1. The closer alpha is to 1, the greater

is the internal consistency. In the study, the Cronbach alpha was 0.943, which is very high. It indicates strong internal consistency among the items in the questionnaire.

Mean ratings were calculated from the feedback received, first the overall mean and then mean ratings for the three different categories of respondents: clients, contractors, and consultants. The purpose was to ascertain whether different construction industry participants had different views about the various initiatives presented. Statistical t-tests of the mean were carried out to check the entire likely response to the issues raised in the questionnaires, based on the sample's ratings. Analysis of variance (ANOVA) was undertaken to test equality of different population means. The test was undertaken to identify whether the views from different groups of respondents on various initiatives were similar.

4. Results and discussion

5.1 Interviews

As encouraged by the C21 report, BOA and PEBoard made CPD compulsory as a pre-requisite for renewing the practising certificates. SIP, SISV and others also require members to undertake minimum CPD. However, it is important to strike a balance. As Interviewee 2 explained, *"If you enforce it strictly, you may lose some members, but gain some respect as an institution."* Interviewee 6 noted that CPD may be more effective for certain professions than others; for example, he felt it is more effective for architects than for quantity surveyors.

The interviewees agreed that CORENET has been the most significant achievement of C21. The C21 report recommended that all contractors, including sub-contractors, be licensed to influence their standards and professionalism. According to Interviewee 8, who was involved in the preparation of the C21 report, there had to be many compromises along the way.

C21 recommended that an industry-wide code of conduct spelling out industry standards with regard to the working relationships among the various players be developed. The interviewees disclosed that the codes of conduct were drafted, but they were not implemented, because, according to Interviewee 2, who took part in drafting the codes, the codes were considered by the members of the CIJC to be too general and so the document was considered to be unnecessary. Interviewee 6 noted that it is unreasonable to attempt to formulate an industry-wide code of conduct. In the opinion of that interviewee, it would not possible to enforce such a code as there could be no sanctions; he suggested that regulation of the industry should not go to that extent.

In summary, the interviewees agreed that the level of professionalism in the industry has improved. They also noted that there is scope for further progress. Interviewee 4A noted: *"If you want professionalism, then you must downplay regulation, or have regulation with a lighter touch, and allow peer pressure to raise standards. We can say that professionalism has been achieved when the industry does the right thing without too many regulations."*

5.2 Questionnaire survey

Respondents were asked to express their views of the effectiveness of the C21 report in addressing the problems of the construction industry on a scale of one to five (1 = “very effective”, 2 = “effective”, 3 = “neutral”, 4 = “not effective”; and 5 = “not effective at all”). The results (Table 3) show that the respondents gave a moderate vote of confidence (average of the means of 2.77). Although there were no significant differences among the scores of the three different groups in the sample, the clients (average of the means of 2.68) and the main contractors (average of means of 2.71) gave a slightly stronger vote of confidence than the consultants (average of means of 2.89).

Table 3 Mean rating and ANOVA for effectiveness of C21

	Mean rating				ANOVA	
	Whole sample	Clients	Consultants	Main contractors	Sig. level	*F*
How effective do you think the C21 initiatives have been in addressing all the problems of the construction industry?	2.77	2.68	2.89	2.71	0.115	2.181

Comparing all the results on the six strategic thrusts, the highest rating in terms of effectiveness was accorded to Strategic Thrust One: “Enhancing the professionalism of the industry”, with an average of the means of 2.39. This average of the means showed that the respondents agreed that the implementation of Strategic Thrust One had been more effective than that of any of the other thrusts and the C21 programme in general. Also, among all the particular measures, the increase the use of IT in general (average of means of 2.26) was considered most effective.

For Strategic Thrust One, all the means were between 2.26 and 2.50 (Table 4). It indicated that the firms moderately agreed that the measures had improved the professionalism of the construction industry. However, the clients had different opinions from the contractors and consultants on the degree of effectiveness of different measures. For the clients, it was the licensing of all contractors that had contributed the most to enhancing the professionalism of the construction industry. For contractors and consultants, it was the increase in the use of IT that played the most significant role.

Clients perceived industry awards to have the lowest rating in terms of effectiveness. Consultants gave lowest rating to the same measure, and the mandatory requirement of the CPD programmes. Main contractors gave the lowest rating to the increase use of CORENET programmes, while consultants gave it a high rating.

Table 4 Mean rating and ANOVA for Strategic Thrust 1

Variables	Mean rating				ANOVA	
To what extent do you believe the following measures have improved the *professionalism* of the industry?	Whole sample	Clients	Consultants	Main contractors	Sig. level	*F*
Various courses offered by the educational	2.34	2.18	2.39	2.34	0.45	0.79

institutions, professional bodies, and BCA Academy, designed to meet the needs of the industry.					2	6
The mandatory requirement of the Continuing Professional Development (CPD) programmes for the renewal of professional and trade membership.	2.50	2.18	2.61	2.49	0.087	2.463
Industry awards to promote and recognise achievements such as quality of work, productivity, innovation, and green performance.	2.45	2.36	2.60	2.38	0.104	2.280
The increase in use of IT in general.	2.26	2.32	2.21	2.27	0.750	0.288
The increase in use of CORENET programmes.	2.39	2.23	2.20	2.53	0.004	5.598
Progressive strengthening of Contractors Registration System.	2.42	2.23	2.45	2.43	0.460	0.779
The licensing of all contractors (including sub-contractors).	2.34	2.14	2.33	2.38	0.391	0.943

5. Concluding remarks

Efforts to improve professionalism in the construction industry in Singapore have included actions by individual professionals, professional institutions and trade associations, and at the broad industry level, following specific recommendations outlined in the C21 report. The respondents to the field study agreed that C21 had been effective in addressing some of the problems of the construction industry. In their opinion, measures taken to enhance professionalism had been effective. The initiatives under Strategic Thrust One were adjudged by the respondents as being the most effective in the C21 programme. The study also showed that practitioners consider CORENET to have been the most significant achievement resulting from the recommendations of the C21 report.

The findings from the study also indicate that much more can be done in the effort to enhance professionalism in the construction industry. There is a need for holistic co-ordination of the training programmes for professionals. The industry and academic institutions should work together to develop syllabuses that are in line with developments in industry practices and procedures. The implementation of CPD programmes for construction practitioners was considered by the respondents to have been successful. However, there is a need to ensure that the practitioners do not participate in CPD programmes just simply to collect the points, or amass the hours necessary for registration or membership renewal. There should be a system within each firm and institution to ensure that the practitioners retain, actually apply and also share the knowledge gained from such programmes.

The awards given at the industry level in Singapore construction have motivated construction firms to achieve excellence in many aspects. The development and application of IT in the industry has been greatly deepened, and has moved ahead with the use of BIM as the platform to facilitate the integration of knowledge and information. Here, Singapore is among the world's leaders. The licensing of all contractors (including sub-contractors) has also been useful for raising the standards of professionalism of the contractors.

To build on the achievements in enhancing professionalism in construction in Singapore, there should be continuous monitoring and periodic review of initiatives and policies as circumstances change. There should also be effective multi-stakeholder collaboration on performance improvement, involving the industry, government, clients and universities.

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