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## **The Role of Project Managers in Construction Industry Development**

Martyn J. Hills, Paul W. Fox, Carol K. H. Hon, Patrick S. W. Fong, and Martin Skitmore

### **Abstract**

This paper reports on an international study into construction industry development that was used as a framework for a study into Hong Kong's construction industry and, based on the findings, argues that the role of a project manager is important to the development of the industry. Having used the same approach for both studies allowed for comparison with and validation of the international generic model. Statistical factor analysis was used to generate the following eight factors that are currently active in the development of Hong Kong's construction industry: financial resources; physical resources; competition; coordination and cooperation; government intervention; long-term vision and policy; communication between government and the industry; and a learning culture. Whilst these factors are sometimes different to the generic model, there is more that they have in common. Many of these have important implications for the role of project managers in the industry. The findings explained in this paper are helpful to all stakeholders in the construction industry from project managers to policy makers worldwide, who face similar challenges to those found in Hong Kong when considering how to best contribute towards the development of their particular construction industry. The paper provides clear examples to show that project managers are in the unique position of being able to significantly influence and effectively promote construction industry development through their management skills and values at various levels, including those at the grass-roots.

Keywords: construction industry development, project managers, knowledge management, role.

### **Introduction**

Over the past quarter of a century construction industry development has drawn considerable attention from governments and practitioners around the world. As a result of this attention and the growing realization that there is a genuine need for the industry to improve its performance and image, a number of reviews of the industry have been conducted in many different countries that have identified problems related to the industry of that particular country and then provided practical suggestions for bringing about the changes necessary for developing its construction industry. These reviews began in the United States with a series of reports published in 1982 and 1983 by the Business Roundtable, known as the CICE Project [2], that were the result of a five-year study involving over 250 construction experts. The findings provided 223 recommendations that centered on how to manage construction projects better in order to optimize capital investments. Other countries eventually followed this lead by commissioning reviews of their construction industry and publishing reports. These reports include the UK's Latham report [19] and Egan report [9] published in 1994 and 1998 respectively; Singapore's Construction 21 report [22] published in 1999; Hong Kong's CIRC report [6] published in 2001; and Australia's Construction 2020 report [7] published in 2004. There have also been many national and international studies dating as far back as the 1940s, most of which have been documented by Fox and Skitmore in their 2007 study of the construction industry [13].

However, most of the reports and studies were either without a theoretical framework or had applied theories from other domains, such as economic theory, systems theory, statistical theory, fuzzy set theory, transaction cost theory, and catastrophe theory. Furthermore, only a few of the studies had

adequately recognised the interests of stakeholders or had taken sufficient account of the concepts of power, status, learning, boundaries, goal evaluation, innovation and sentient group values. In 1989 Fox [10] was one of the first to propose a theoretical framework for construction industry development by producing a model comprising fifty factors to explain the nature and implications for development of Hong Kong's construction industry and in 1996 Momaya [20] investigated the competitiveness of the Canadian construction industry and consequently developed a hierarchical model grouping ninety-five variables into factors. In 2003 Fox [12] conducted an international study of the construction industry using a grounded theory approach that produced a generic model revealing the key factors that facilitate construction industry development worldwide. Many of these factors were cultural factors that had not hitherto been identified by other studies. A subsequent study in Hong Kong carried out by Fox *et al* in 2008 [14] applied the same methodology used in Fox's generic model to Hong Kong's construction industry and found that traditional factors have a more dominant influence on the continuous development of the construction industry. Some cultural factors were active but did not feature so prominently. These findings are used in this paper to provide indications to all stakeholders, and in particular to project managers, as to the part they can play in developing the construction industry.

### **Construction Industry Development**

The construction industry may be defined as comprising those organisations involved in design, production, alteration, renovation, maintenance, facility management, demolition and re-cycling of building and civil engineering works, including the supply of resources. It includes all internal and external stakeholders who in some way or another promote the industry's policies, procedures, practices and culture. Ofori defined construction industry development as: "a deliberate and managed process to improve the capacity and effectiveness of the construction industry to meet the national economic demand for building and civil engineering products, and to support sustained national economic and social development objectives" [21]. This paper uses Hong Kong's construction industry as an example of the need for such development because even though it has erected some of the world's tallest and most impressive buildings and successfully undertaken mega infrastructure projects, Hong Kong's industry faces the same challenges as the construction industry in other developed countries from globalization, increasingly high construction cost, and competition from other countries.

Before considering the specific need to develop Hong Kong's construction industry, it is necessary to have some idea of its extent and importance to the economy. The overall construction market has declined steadily over a ten year period from 1998, reducing from US\$14 billion to half this value by 2005. The local construction sector accounted for 2.8% of GDP, by factor cost, in 2005. This was a very low level compared to previous years in Hong Kong (e.g. 4.7% in 2000), or also compared to levels in other countries, and was well below typical levels of 5%. As of March 2007, the sector employed over 50,300 site workers. The employment level for the broader building, construction and real estate sectors is over 230,000 including such professionals as architects, surveyors, structural engineers, building services engineers and civil engineers. The gross value of construction work performed by main contractors reached US\$2.87 billion in the first quarter of 2007, up 1.8% year-on-year [1].

Hong Kong's construction industry has been facing not only economic difficulties since the turmoil of the Asian financial crisis in 1997 and 1998. The industry was dealt a severe blow to its image and the public's confidence in it shaken as a result of two high profile substandard piling cases that came to light at the turn of the millennium. In the aftermath, the Hong Kong Housing Authority issued a report [17]

which advocated partnering, product quality, professionalism and productivity to improve performance of the industry. And, in 2001 the Hong Kong Construction Industry Review Committee published its report [6] which went some way to addressing the public outcry over the piling scandal by recommending 109 changes to the industry; the Construction Industry Council [3] was established in 2007 to implement the recommendations of the CIRC report. In an effort to assist the industry to develop in a sustainable manner, research funded by the Construction Industry Institute-Hong Kong (CII-HK) [5] was undertaken to identify opportunities and the way forward for various construction industry stakeholders; one such opportunity was considered to be exporting project management skills to China, India, and the Middle East.

Given the condition of Hong Kong's construction industry, it was appropriate that it should be selected to test the applicability of Fox's generic construction industry development model to a specific country or region. Fox's model was developed from his international study that identified a set of eight factors that Fox claims drives the development of the construction industry worldwide in both developed and developing countries. The factors in Fox's generic model, ranked in declining strength, are: 1) human skills and a culture of transparency; 2) financial resources and investor confidence; 3) government policies and strategies supporting construction business; 4) self-reliant construction culture; 5) institutional support; 6) industry-led better practice and culture; 7) supportive attitudes from aid agencies; and 8) research and development for construction. Results from the application of the methodology to Hong Kong's construction industry confirmed that not only did the model's traditional factors exert influence on construction industry development in Hong Kong but so too did some of the newly-identified cultural factors.

### **Research Methodology**

Data for the Hong Kong study was collected by means of a questionnaire survey. The questionnaire asked respondents to rate the current strength of a list of variables in the Likert scale of 1 to 5 in accordance to the construction industry of Hong Kong. The list of variables was based on that of Fox's 2003 study, which reviewed over 50 years of studies on construction industry development. However, those variables obviously not applicable to local situation of Hong Kong were amended or eliminated. The variable list was confirmed with 13 semi-structured interviews with industry experts and 4 variables that were found to be local characteristics of the Hong Kong construction industry were added. Finally, a list of 50 variables was produced.

A total of 1022 questionnaires were sent to a selection of stakeholders of the construction industry. They included clients, consultants, designers, contractors, quasi-government bodies, government, professional bodies, lawyers, material suppliers, educators/trainers, researchers, trade unions and publishers. Information was based on the Hong Kong Builders Directory, websites of the professional institutions, quasi-government bodies and government departments and other related websites. Another batch of questionnaire was sent out to graduates and postgraduates of the Department of Building and Real Estate of The Hong Kong Polytechnic University as most of them are current practitioners in the industry. A total of 252 questionnaires were completed giving a response rate of 24.7%.

### **Analysis of the Data**

Data obtained from the questionnaires were analyzed with the statistics software package SPSS 14.0 and factor analysis used to obtain a lesser number of underlying factors measured by the variables. The variables were extracted by Principle Component Analysis and rotated by Varimax. Factor scores were

then calculated to compare their levels of importance. Before running the factor analysis, tests for homogeneity were performed. Variables found to be non-homogeneous or with a measure of sampling adequacy value below 0.5 were deleted. Variables with factor loadings lower than 0.5 were also considered for deletion during the processes of factor analysis until an interpretable result was found. A nine-factor model encapsulating 34 variables was generated. The Kaiser-Meyer-Olkin value is 0.860 which is considered to be meritorious (Norušis, 2005). Total variance explained is 63.367%. Bartlett's Test of Sphericity produced an approximate  $\chi^2 = 2506.880$  ( $d.f. = 561, p = 0.000$ ). Communalities of all variables, except for two, are well above 0.5. Several models were generated and different methods of rotations considered before choosing the final model.

### **Results of the Hong Kong Study**

The results from the Hong Kong study generated a list of factors in descending order of strength, these factors being as follows: (1) Financial Resources; (2) Physical Resources; (3) Competition; (4) Coordination and cooperation (5) A Learning Culture; (6) Communication between the government and industry; (7) Long-term Vision and Policy for the Industry; and (8) Government intervention. Compared to the generic model, the results from the Hong Kong study show a lower level of strength of cultural factors, that is, those factors that are more about people and practices. Hong Kong strengths are perceived as resting more on traditional factors such as financial and physical resources and high competition. The role of project managers is not influential evenly throughout these factors. Whilst their influence can be seen in the cultural factors to a great degree, the dominance of traditional factors allows them little scope for improving the industry's performance. Our interpretation of this role is explained in the following sections.

#### **(1) Financial Resources [traditional factor]**

Availability of finance and availability of investment are the two variables that load on this factor. Hong Kong's construction industry is business-led and is in fierce competition with other industries for finance and investment. However, the availability of finance is plentiful, as the banks and other suppliers of finance seek opportunities for investment. Since Hong Kong has become a developed city, one can expect that new building projects and infrastructure works will diminish in the future. Thus, as the city becomes older the investment is likely to be diverted to redevelopment and refurbishment projects. Project managers have very little influence over either of these two variables, so their role is very limited in this respect.

#### **(2) Physical Resources [traditional factor]**

Availability of materials and availability of plant/machinery are variables that contribute to this factor. In the old days, materials had to be sourced worldwide but with the rapid rise of China, many construction materials can be sourced from China at lower costs and reasonable quality. In recent years, a great deal of prefabrication is also carried out in China. Because Hong Kong has to import virtually all of its materials, a cheap and reliable source is very important for the industry's development. Project Managers can influence the performance of the industry through their control of the material supply chain, particularly at the stage of negotiations concerning delivery times, checking of factory production quality and progress, and the conformance with specification upon delivery and site installation. Attention to these details sends a clear message to existing and potential suppliers that there are multi-criteria to satisfy; that price alone will not be sufficient to satisfy a sophisticated market that Hong Kong is becoming.

The Project Manager will have more of a role to play in terms of plant selection for projects. Although this market is still immature in terms of variety of suppliers and qualifications of their staff, the use of plant is increasingly given more scrutiny to ensure high utilization, closer matching of equipment capacity to site needs, and increased reliability, as well as stricter requirements for safety in operation. As with material and component supply, the project managers, as representatives of the project clients, are gradually raising standards, so that the expectations are translated into better performance from plant suppliers.

### (3) Competition [traditional factor]

The variables contributing to this factor are: Competition between local contractors; influence of senior construction managers' perceptions; and competition from overseas contractors. There is fierce competition in the market, especially since the downturn in the overall construction market of the past five to eight years. The construction industry in Hong Kong is controlled by several key players with many small to medium size firms having been driven out of the market [18]. Contractors in Hong Kong have also been facing keen competition from the influx of contractors from Mainland China. The prevailing norm of lowest bid tendering policy results in cut-throat competition. Project managers employed on behalf of construction clients have a significant influence over the level of competition through the inclusion of high numbers of bidders for projects. Many observers believe this to be overly competitive, and not in the interests of the health of the industry as a whole, or the clients it serves. Departures from a lowest bidding approach include partnering and selective tender lists with no obligation to accept the lowest tender.

Project managers have significant influence through other measures to improve competitiveness. For example, their careful choice of production methods can save manpower and reduce overall costs, as well as reducing risk and environmental damage. Labor productivity can be improved as a result. The leading companies adopt better practices from exposure to international trends and are proud to proclaim their good results as witnessed in the reports of Gammon Construction in 2006 [15] and Hip Hing Construction in 2007 [16].

### (4) Coordination and cooperation [cultural factor]

Fragmentation of organizations and functions in the industry; the claims culture; trade associations and professional associations are the variables impacting on this factor. Problems of lack of coordination and cooperation have long been recognized by the industry. Partnering and other management strategies have been promoted with a hope of bringing about cooperation, trust and a better working relationship which in turn should improve overall performance. A claims culture has long prevailed in the industry, especially since the economic downturn in 1998 when contractors undertook projects at very low contract prices with the intention of submitting claims to cover their costs.

Project managers can exert a key influence here through adhering to high ethical standards of behavior, and championing the cause to deal honestly with the key stakeholders. Being leaders, project managers can be role models to others around them and avoid deceitful practices that undermine trust and confidence of all. Given that all projects involve a large number of different specialists in both the design and the construction stages, project managers play a unique role in coordination between them so as to ensure fair play and equitable solutions to the problems that arise.

#### (5) A Learning Culture [cultural factor]

The five variables that contribute to this factor are all concerned with forming a learning culture in the industry. The variables are: confidence in professional skills; availability of craft and operative skills; training and education; attention to best practice; and availability of technical knowledge. University graduates qualify not only with their degrees but also with recognition from appropriate professional institutions. In order to maintain their professional competency and to keep themselves moving forward within the industry they are also expected to carry out continuous professional development. However, workers and tradesmen do not receive sufficient training especially when there is an influx of untrained workers from Mainland China. Training for these frontline workers is provided by the Construction Industry Council Training Academy [4] but the courses are criticized as not being practical enough [11]. Few local youngsters enter the construction industry and those from the mainland would generally not attend courses. A learning culture is at the moment the most important cultural factor affecting the continuous development of Hong Kong's construction industry. The adoption of knowledge management concepts would bring benefits from project to project.

Again, through their unique status within project teams, project managers can cultivate the attitudes and behavior of team members to adopt new ways of tackling construction problems. Success in this can breed the self-confidence necessary to ensure the industry is attractive to new recruits, as well as retain the capable existing talent. There is clear evidence of this happening in the best companies, but further improvements are needed in the myriad of smaller subcontracting enterprises that struggle for survival in the lower levels of the subcontracting hierarchy. Project managers have much less influence here. The huge reduction in the construction market over the past ten years has seen a considerable reduction in the workforce. Many of those who have left are the relatively unskilled, leaving the better quality workers to continue the little amount of work that is available. Such a major shake out may be already showing good results, such as the significant reduction in accidents. Productivity gains are also apparent.

When the industry workload picks up, the project managers can exert their influence by raising the entry standards for skills required as well as substituting prefabrication for traditional methods, so as to avoid recruiting large numbers of unskilled workers back into the industry. Hong Kong has moved beyond the stage where it must compete through cheap labour. The trend now is for higher trained and higher qualified workers to be employed, using more efficient methods through innovative practices. This is consistent with the recommendations of the CIRC report which called for a more professional workforce, especially the manual workers [6].

#### (6) Communication between the government and industry [cultural factor]

Four variables influence this factor: communication between government and contractors; availability of information; government's concern for its image; and use of construction IT. At the moment, there is not enough communication between the government and the industry. Regulations and guidelines are sometimes not effectively disseminated to the industry. Government departments have less flexibility to deal with contractual settlement. The widespread use of information technology in the industry is only just now emerging. It is hoped that the Construction Industry Council [3] will take up the role of communicating between the government and the industry.

Project managers may have limited ways in which they can make their influence felt in relation to this factor. One way is to provide performance data on projects to government. This already occurs for safety

matters, but other Key Performance Indicators (KPIs) can be also used to give a wider picture of problems and successes in project terms. There is still more that can be done to make use of current Information Technology in the government–industry relationship. Further, project managers can be more pro-active in adopting knowledge management practices so that the learning opportunities are not wasted.

(7) Long-term Vision and Policy for the Industry [cultural factor]

There are six variables contributing to this factor: long-term thinking of industry; investor confidence in political environment stability; appropriate production technology selected by contractors; research and development; availability of management skills; and innovative project procurement strategy. Short-term thinking and lack of permanence has been the situation in the Hong Kong construction industry for many years. Development has been piecemeal and has not been planned in a far-reaching way. Problems have arisen in the past because of the lack of long-term vision for planning and development. Many infrastructure works are still pending government approval with developments such as West Kowloon and the old Kai Tak airport delayed for years due to numerous consultations and lack of consensus.

Project managers have an important role to play in several ways. They can contribute through their membership of professional institutions and make suggestions for the long term changes in the industry. They can be drivers of innovation, through adoption of new technologies and procurement systems, and through facilitating research studies on their projects.

(8) Government Intervention [traditional factor]

The only two variables contributing to this factor are: Government intervention; and encouragement for contractor's self-development through a ladder of opportunity for main contractors and subcontractors. In the past twenty years, the government has impacted the industry significantly. The Hong Kong government was a big client spending on public housing and infrastructure projects such as the new airport known as the Airport Core Project. The government has greatly eradicated corruption in the construction industry with the establishment of Independent Commission Against Corruption (ICAC) and has enforced safety in the industry through legislation and regulations. However, these regulations and associated bureaucratic procedures have been criticized for being too complicated and for reducing the flexibility of doing business; there is a need for both but the balance is clearly difficult to strike. This factor is the least important of the eight.

When considering the ladder of opportunity for subcontractors to develop their expertise, project managers, again, have a unique role to play in fostering improvements through running training workshops on site. This is an activity that has existed in the Hong Kong construction industry for the last ten years [11].

**Implications for Project Managers**

Every stakeholder has a role to play in the development of the construction industry. Clients, contractors and governments have a responsibility to lead the necessary change and project managers representing clients or contractors at project level are actually in a unique position to change the industry from the grass-roots level. Project managers in construction are responsible for the overall success of delivering the owner's physical development within the constraints of cost, time, quality, environmental and safety requirements. They need to be technically competent and to be able to adapt to the changing industry



environment by relying on knowledge and skills acquired through training and experience. They also need to supplement with non-engineering knowledge and skills to meet their changing responsibilities. Project managers have the role to create knowledge, distribute knowledge and identify hindrances to knowledge acquisition [8].

Despite this knowledge role, the application of knowledge management to improve project management performance and competence is not widely discussed, nor is there recognition of how effective project management practices could improve knowledge management. Knowledge management in project-based industries such as construction confronts difficulties that are not commonly encountered by non-project industries. Project-based organisations work on lifecycles that are often long, non-repetitive, and typically organized around teams assembled specifically for the project and are often disbanded upon the completion of a project. Normally, people from different companies come together for the first time as a project team which is essentially a form of temporary organization. This means there is a need to create the right knowledge-sharing culture, allow access to explicit knowledge from different repositories, and access and internalize learning from previous projects. However, most of these learning opportunities are tacit in nature and stored in peoples' memories. In addition, the prevailing supply chain and procurement practices in construction discourage effective learning practices. Instead, the industry allows the continuation of 're-inventing the wheel' and experience of good practice is wasted by not being repeated in future projects.

The major responsibilities of project managers are generally accepted to be controlling financial and physical resources in order to bring a project to a successful conclusion in terms of cost, time, and stakeholder satisfaction. However, Fox's 2003 international study [12] that identified cultural factors as being important contributors to the development of the construction industry, suggests that project managers are required to go beyond their traditional role to become agents of change. Project managers have an obligation to the industry to recognize that they have a role to play in the change process by promoting behaviour that leads to desirable change.

### **Conclusion**

Project managers can play an important role in driving construction industry development. Successful project managers often become senior managers in their organizations, responsible for strategic and policy decisions. They bring forth the positive attitudes and mindset to different projects that, in the end, improve the whole industry. The traditional role of project managers in controlling time, cost, quality, safety and environmental issues, can now be supplemented by their role as drivers of change in order to ensure the continued development of the industry in which they work. The enlargement of their existing role can only be realized if they are aware of the needs in the industry as a whole. Thus, the long-term vision and policy for the industry needs to be clearly announced publicly, so that various stakeholders can reflect over it and determine what it means for themselves as individuals. Apart from publicity, such a vision needs a champion to encourage stakeholders to commit to it. Project managers have a key role in supporting such a vision, and will be an important part of the construction industry community to bring about its realization.

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