Pilot Case Study of New Engineering Contracts (NECs) in Hong Kong - Joy or Tears?

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Abstract: The New Engineering Contract (NEC) is regarded as a series of standard contracts which promotes the execution of good project management principles and practices under a spirit of mutual trust and co-operation. This paper aims to illustrate the background knowledge and project performance of the first trial construction project procured with the New Engineering Contract Version 3 - Engineering and Construction Contract (NEC3 ECC) in Hong Kong through a case study investigation. Various key performance indicators of the project were determined via documentary analysis and a series of in-depth interviews with the senior representatives of the key project stakeholders. Useful insights can be generated according to the hands-on experience derived from this trial project to the potential users of NEC3 ECC in the construction industry from other countries, in particular those where NEC3 ECC has not yet been adopted. The case study findings would benefit both the construction academics and industrial practitioners in elucidating the project performance of a real-life case study of applying NEC3 ECC in the East, providing more empirical evidence in the growing body of knowledge and developing a strong basis for future research such as an international comparison of project performance of NEC3 ECC construction projects between the East and the West.

Keywords: New Engineering Contract; Engineering and Construction Contract; Target cost contract; Case study; Procurement method; Hong Kong.

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1 Introduction

Procurement and contracting strategies are crucial to the success of every construction project as they establish the basis for co-operation between the client and the contractor. Nevertheless, due to the increasing complexity and uncertainty of projects nowadays, high level of co-ordination and co-operation amongst project participants is required (Pesamaa *et al*., 2009). The conventional project delivery approaches have attracted numerous criticisms for causing disputes and adversarial working relationships, which in turn lead to time and cost overruns and poor quality of work. Novel contracting strategies have therefore emerged worldwide to facilitate proactive problem solving, to establish common goals of various contracting parties and to encourage greater collaboration between the contracting parties (Construction Industry Review Committee, 2001). In recent years, a multitude of employers have selected NEC3 (New Engineering Contract Version 3) ECC (Engineering and Construction Contract) which is specially designed for partnering or collaborative working, and positive responses have been reported by early users (e.g. Wright and Fergusson, 2009; Bryant, 2012; Chan *et al*., 2014; NEC Users' Group, 2015).

NEC3 ECC has gained wide popularity within the construction industry of the United Kingdom over the past two decades with its intended purpose of achieving more favourable project outcomes. It is now in use in over 20 countries and regions including the United Kingdom, France, the Netherlands, Sweden, New Zealand, Australia, South Africa, United Arab Emirates, India and the Philippines (Chan *et al.*, 2014). As a result of the lessons learned from these successful cases overseas, the relevant works departments under the Development Bureau of the Hong Kong Special Administrative Region (SAR) Government have adopted NEC3 for a series of over 30 "pilot/trial" construction projects since August 2009 to test its applicability and to encourage more collaboration from the different contracting parties within the project team. An extensive desktop literature review has revealed that although the perceived benefits (Wright and Fergusson, 2009), key operational principles (Broome, 2012), and perceptions towards NEC3 (Sun and Oza, 2006), have been documented in previous literature, yet there is a scarity of research publications about the application of NEC3 ECC in the East. This paper serves as an attempt to report on the project performance of the first trial of NEC3 ECC in Hong Kong.

2 Overview of New Engineering Contract Version 3 (NEC3)

The New Engineering Contract (NEC) is a modern family of standard contracts which facilitates the implementation of sound project management principles and practices based on a spirit of mutual trust and co-operation, which also defines the legal relationships between different contracting parties (NEC, 2005). The third version of NEC (i.e. NEC3) was published in June 2005, and the Engineering and Construction Contract (ECC) is the main contract for a typical construction project between an employer and a contractor. According to Broome (2012) and Wright and Fergusson (2009), there are 23 interlocking contract documents and guidance books in addition to the third edition of ECC including:

- Engineering and Construction Contract (between an Employer and a Contractor)
- Engineering and Construction Subcontract (between a Contractor and a Subcontractor)
- Professional Services Contract (between an Employer or a Contractor and a Consultant)
- Adjudicator’s Contract (between two contracting parties and an Adjudicator)

- Engineering and Construction Short Contract (for “simple” work)
- Engineering and Construction Short Subcontract (for use with the ECC or EC Short Contract)
- Term Services Contract (where the contract is for a period of time rather than a single project)
- Framework Contract
- Guidance Notes and Procurement and Contract Strategies Guide (including flowcharts)

Amongst the contracts listed above, NEC3 ECC (i.e. the main contract) has captured much attention of reseachers worldwide in recent years. Sun and Oza (2006) surveyed 85 clients, contractors and consultants based in the United Kingdom, of which 97% had used the NEC ECC contracts, and 88% of all parties rated the contract as excellent or good. Wright and Fergusson (2009), via a case study in New Zealand, found that NEC3 ECC provides a structured project management framework, flexibility in terms and conditions of contract, well-defined contractual procedures, clear plain language, together with a proactive and forward looking environment.

Lord *et al*. (2008) compared the development of construction contracts in Mainland China and the United Kingdom. They opined that relational contracting (NEC being one of the standard forms used in this field) could be effective in the construction market, provided that appropriate counter-measures are adopted to eliminate the obstacles of such form of contracting.

Heaphy (2013) drew a comprehensive comparison between two popular international construction contracts namely NEC3 ECC and FIDIC. He was of the view that both forms of contract are designed to be used for all kinds of construction works on an international basis. NEC3 ECC attempts to encourage collaborative behaviours, proactive risk management and good project management. Employers are advised when making decision on whether to adopt NEC3 ECC or FIDIC to decide how much they want to operate the contract and approach they wish to take in engaging the supply chain in the projects concerned.

Mickovski *et al*. (2013) reported on a case study of infrastructure project in Scotland procured with NEC3 ECC Option A (Priced Contract with Activity Schedule). Their study reflected that all parties to the contract have to be motivated and engaged in identifying opportunities for value engineering and sustainability benefits in order to achieve the overall goals of the project. Rooney and Allan (2013) advocated that those highways projects procured with NEC3 ECC performed better than those with the Institution of Civil Engineers (ICE) Standard Form of Contract located in the United Kingdom in terms of time and cost predictability. Judging from a desktop review of previous research studies, most of them put emphasis on the application of NEC3 ECC in the West, not much has been done in analysis of cases in the East, especially in the Hong Kong context. This finding from literature review further reinforces the aim of this study (i.e. to report on a case study in Hong Kong and serve as a foundation for further research in NEC3 ECC in Hong Kong).

3 Case Study Methodology

Case study is considered as a research method in which one case will be scrutinized in depth, adopting whatever methods are deemed suitable. The main thrust is to establish a full understanding of that case as far as possible (Silverman, 2005). The purpose of carrying out a case study is to explore the particularity and the uniqueness of a single case (Simons, 2009). This

research method is particularly relevant to the construction industry which is project driven and made up with many different kinds of organizations (e.g. employers, main contractors, consultants, subcontractors, etc). Fellows and Liu (2015) considered that case study is a research method used to investigate experimental theory or topics using set procedures, usually with different combinations of data collection (e.g. interview and documentary analysis) where the emphasis is towards exploring a phenomenon within a context. Yin (2009) also concurred “case study” as an empirical inquiry which probes a contemporary phenomenon and context that are not clearly evident and comprises a bundle of sources of evidence. Case study is an appropriate research method in this study as this should be used for studying new phenomena where quantitative research methodologies are not possible or appropriate.

Qualitative information was derived from relevant archives through documentary analysis, participants' observations in regular project meetings and partnering workshops, and in-depth interviews which are considered to be typical and effective ways in case study research (Eisenhardt, 1989; Yin, 2009). The personal observations and recommendations of the NEC advisors were included as well in this study to offer important insights and valuable lessons learned for further improvement of contract administration of future similar NEC3 cases in Hong Kong. In addition, the various key performance data of the case study were measured and analyzed throughout the course of the project.

4 Highlights of Case Study Project

The name of the case study project is the "Improvement of Fuk Man Road Nullah Project in Sai Kung" with the Employer being the Drainage Services Department (DSD) of the Hong Kong SAR Government, the Project Manager being the Chief Engineer (Drainage Projects) from DSD, the Supervisor being Black & Veatch, the Contractor being Chun Wo Construction & Engineering Company Limited, together with the NEC Advisor and Partnering Workshop Facilitator (JCP Consultancy International Limited). It was the first Hong Kong SAR Government’s pilot project to try out the New Engineering Contract (NEC) to foster a partnering and collaborative working relationship between the employer and the contractor, and the form of main contract chosen was the Engineering and Construction Contract (ECC) Option C: Target Cost with Activity Schedule. Figure 1 indicates the scope of works for the case study project. The scope of works included the decking over an existing about 180 m long and 12 m wide open nullah at Fuk Man Road in Sai Kung, constructing a 4,000 m^2 urban park over the top and upgrading an adjacent roundabout improvement works (Chan *et al.,* 2014). The construction work commenced in August 2009 and was completed in May 2012 at a final project cost of about HK$72.9 million.

5 Final Out-turn Performance of Case Study Project

A first partnering workshop was organized for the representatives of the Employer, Project Manager, Supervisor and Main Contractor to get familiar with the contractual procedures and key features of NEC3 ECC. In the same workshop, they developed a set of mutually agreed project objectives and target project outcomes. All of them agreed on how they needed to work together in order to achieve these stated common objectives and expected outcomes upon project completion. The project team including the representatives from the client (government) departments, the

consultant team and the main contractor jointly established a set of five Key Performance Indicators (KPIs) for measuring these objectives throughout the construction stage of the case study which is the first NEC3 construction project in Hong Kong.

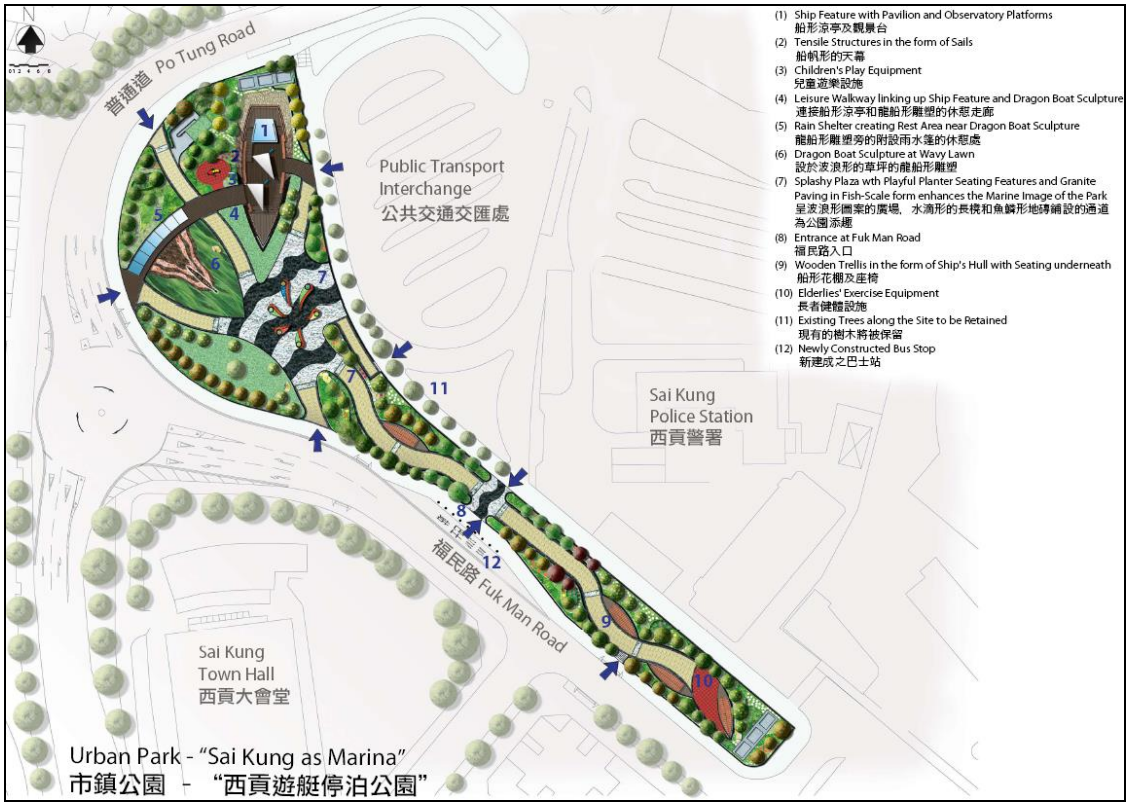

Figure 1. Outline scope of works for the NEC pilot case study project

With reference to Table 1, the overall performance of the case project is satisfactory since the final out-turn performance could meet or even exceed the target outcomes. As Takim and Akintoye (2002) suggested, user satisfaction is one of the important performance indicators for effectiveness of a project. It is also incorporated in the web-based construction project performance monitoring system proposed by Cheung *et al*. (2004). Under the performance measure of user satisfactions, the two client departments (i.e. the Leisure and Cultural Services Department and the Drainage Services Department) jointly rated 8 out of 10 marks. This finding has evidently manifested the overall project performance to be outstanding. Perhaps, the performance of the project under other performance measures may generate more evidences to support this notion.

The project was delivered in 141 weeks against an extended contract period of 165 weeks (i.e. completed ahead of schedule by 24 weeks or 6 months). It outperformed amongst many other completed construction projects in Hong Kong against the measure of time performance. When compared with other construction projects, for example, Chan *et al*. (2010) reported that the modification and extension works of an underground railway station project procured by the target cost contracting model was successfully completed by 7 months earlier than the contract completion date conducive to a time saving of about 20%. Thus, the case project reported herein is adjudicated as satisfactory in respect of time performance.

Table 1. Final out-turn performance of the case study project

Key Performance Indicator	Final Out-turn Performance	Target Outcome	Final Out-turn Performance Exceeds / Matches with Target Outcomes?
1. User Satisfactions	➢ 8 out of 10 by the Leisure and Cultural Services Department (LCSD) and the Drainage Services Department (DSD) ➢ 8 letters of commendation received	➢ 7 out of 10 (Note: Score in range of 1-10, where 1 = totally dissatisfactory and 10 = totally satisfactory)	➢ Yes
2. Time Performance	➢ Completed in 141 weeks against an extended contract period of 165 weeks (i.e. completed ahead of schedule by 24 weeks or 6 months)	➢ 24 weeks of early completion (i.e. completed ahead of schedule by 14.5% or 6 months)	➢ Yes
3. Cost Performance	➢ Agreed final target cost of HK$76.7 million less actual project cost of HK$72.9 million at completion = gain share of HK$3.8 million (i.e. actual project cost reduced by HK$3.8 million equivalent to about 4.95% of cost saving from the agreed final target cost)	➢ 5% of cost saving for gain share between the employer and the contractor	➢ Yes
4. Quality Performance	➢ Minor defects found on non-critical items. Handover to LCSD within 10 days of completion of works	➢ No major rework required	➢ Yes
5. Safety and Environmental Performance	➢ No recorded incidents of safety or environmental infringements, and 4 valid public complaints ➢ 3 industry safety awards obtained	➢ Zero reportable site accident	➢ Yes

Cost performance is perceived to be the most important success factor in the projects procured by target cost contracts that Hughes *et al.* (2012) advocated. The case project was completed with a cost saving of HK$3.8 million which is equivalent to about 4.95% of the agreed final target cost, in comparison with the modification and extension works of an underground railway station project procured by the target cost contracting model mentioned above with 5% cost saving upon completion (Chan *et al.,* 2010). It can be concluded that cost performance is generally favourable due to cost saving behind.

Pertaining to quality performance, which is a significant aspect of performance indicator for construction projects in general (Cheung *et al*., 2004), the project team targeted at project commencement that there would be no major rework. This target was finally accomplished as there were only minor defects identified on non-critical items. Moreover, the whole completed project was transferred to the end-user client department (i.e. Leisure and Cultural Services Department) within 10 days of completion of works.

In terms of safety and environmental performance, the project also met the target outcome agreed at the start of the project and no reportable site accidents were recorded during construction.

What's more, three industry safety awards were received as a result of the outstanding safety management of the project team.

Early settlement of final project account was also achieved with 80% of the compensation events (CEs) agreed at project completion in May 2012, and 100% agreed at end of November 2012. With the early warning mechanism in place under NEC3, a total of 15 early warnings were issued and the unexpected issues were resolved jointly and promptly via the partnering teamwork approach.

6 Conclusions

Construction employers are recommended to adopt the target cost contracting method which ties the individual objectives of the employer and the contractor together with the purpose of establishing some common goals or objectives for a project and improving the traditional confrontational working atmosphere within the project team. However, the application of this alternative integrated form of contractual arrangement is rather new and remains at a infant stage of development in Hong Kong. This paper has reported on the first trial case of applying NEC3 ECC (Option C: Target Cost with Activity Schedule) in Hong Kong. The actual out-turn performance of this pilot case was found satisfactory as a whole when compared with the target outcomes jointly developed by the representatives of different contracting parties during the first partnering workshop. Under the effective operational mechanism of NEC3 by the project team members, the project was completed with high user satisfactions, ahead of schedule, with cost saving, no major rework, no recordable site accidents, and several industry safety awards conferred. While a basket of pilot projects are still on-going in town, it may be premature to conclude that the application of NEC3 ECC is successful in Hong Kong. Nevertheless, this paper has served as a stepping stone for further study and comparison of project performance of NEC3 ECC in both local and international contexts.

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