

Achieving better performance through target cost contracts – The tale of an underground railway station modification project

Daniel W.M. Chan^{1*}, Patrick T.I. Lam², Albert P.C. Chan³,
and James M.W. Wong⁴

* Corresponding author

¹ Assistant Professor, Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China (Email Address: bsdchan@inet.polyu.edu.hk)

² Associate Professor, Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China (Email Address: bsplam@inet.polyu.edu.hk)

³ Professor and Associate Head, Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China (Email Address: bsachan@inet.polyu.edu.hk)

⁴ Postdoctoral Fellow, Department of Civil Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong, China (Email Address: jmwwong@hkucc.hku.hk)

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Abstract

Purpose – This paper aims to explore the implementation framework, project performance, underlying motives, perceived benefits, potential difficulties as well as critical success factors of adopting the target cost contracting (TCC) form of procurement, based on an in-depth real-life case study of a challenging underground railway station modification project in Hong Kong.

Design/methodology/approach – The case project was analysed by means of the related project documentation and face-to-face interviews with the relevant senior representatives from the client organisation.

Findings – The target cost-based procurement strategy generates a plethora of benefits throughout the whole delivery process of the project case, including the provision of cost incentives for the contractor to work efficiently, aligning individual goals of various contracting parties with the overall project objectives, achieving better value for money and more satisfactory overall project performance in terms of time, cost and dispute occurrence.

Practical limitations/implications – Although the selected TCC case study project is based in Hong Kong, the research findings and hands-on experience of the relevant industrial practitioners may be cross-referenced to other similar TCC projects in other parts of the world for international comparisons.

Originality/value – The research study has provided some useful insights into assisting key project stakeholders in maximising the benefits, whilst minimising the detriments brought about by potential difficulties in launching the TCC scheme. It attempts to seek more research evidence to evaluate the entire project delivery process, and capture the levels of success and lessons learned from previous TCC construction projects for generating best practice recommendations to achieve better construction performance.

Keywords: Target cost contracting, Procurement strategies, Gain-share/pain-share arrangement, Performance measurement, Case study, Hong Kong

Paper type: Case study

Introduction

The procurement method holds the key of success for delivering construction services (Chan and Yung, 2003). Strong concerns have thus been raised within the construction industry for adopting alternative integrated procurement strategies to supersede the traditional design-bid-build approach with the concomitant problems of fragmented working relationship and the lack of incentive for project team members to contribute more than just meeting the minimum contractual requirements (Masterman, 2002). Consequently, target cost contracting (TCC), accompanied by a gain-share/pain-share arrangement serving as a cost incentive mechanism, has emerged in the United States, the United Kingdom and Australia with the aim of achieving better value for money and more satisfactory overall project performance (National Economic Development Office, 1982; Trench, 1991).

The Construction Industry Review Committee (2001) of the Hong Kong Special Administrative Region (SAR) also recommended the application of TCC in construction. Under the umbrella of TCC, a fixed target cost is set based on given parameters at the outset of a project. If this fixed target cost is fallen short of or exceeded, the financial gain/pain is split between the contracting parties in accordance with a pre-agreed share ratio. The theory goes that by incentivising the contractor, he will attempt to minimise costs and to achieve value for money. By providing a proper performance-based remuneration, the contractor's financial interests and those of the client become more aligned (Wong, 2006). An attractive by-product of this form of contracting is that since the opportunity for gain-share/pain-share is best realised by working closely with, rather than being simply instructed by, the employer, partnering spirit is thereby cultivated (Longley, 2006). Hence, a target cost contract produces the desirable “win-win” situation for both client and contractor.

Although TCC has been practised in construction for several years, not all projects procured by TCC have been equally successful as anticipated. Empirical research is very limited to scrutinise the overall delivery process, the levels of success and lessons learned from TCC projects. It is therefore valuable to conduct an in-depth case study of TCC applications to explore its implementation process for achieving construction excellence. Hence, this study aims to evaluate a successful underground infrastructure modification

project: the “Tsim Sha Tsui Underground Railway Station Modification and Extension Works” which was the first fully “open-book” target cost contract in Hong Kong.

Two senior industrial practitioners representing the client organisation were interviewed and relevant documentation of the case study project were reviewed to examine the operational mechanism of TCC, and to solicit their opinions on the motives behind introducing TCC, the benefits, difficulties and success factors of implementing the TCC scheme. Most importantly, various lessons learned from this successful case study project in relation to overall project performance are presented and discussed herein.

Although the empirical findings and direct hands-on experience from an individual project may not be generalised or regarded as conclusive, the Tsim Sha Tsui Underground Railway Station Modification Works project has demonstrated a useful and indicative example illustrating the successful TCC experience for a large-scale underground infrastructure modification project based on the lessons learned. This paper begins by briefly portraying the underlying concepts of a target cost contract in construction. The major benefits, difficulties and success factors of applying TCC are also briefly reviewed from the reported literature. The research methodology including the research framework and methods of data collection are then highlighted. It is followed by the empirical results of a case study including the key features of TCC, motives behind as well as the benefits and difficulties of implementing the TCC scheme. The critical success factors and the lessons learned from the case study project are also evaluated. These are then followed by discussions of the applications and implications of the case study findings, before the conclusions are drawn.

Concepts of target cost contracting (TCC)

In the United Kingdom, the National Economic Development Office – Civil Engineering (1982) defined TCC as: “*Target cost contracts specify a best estimate of the cost of the work to be carried out. During the course of the work, the initial target cost will be adjusted by agreement between the client or his nominated representative and the contractor is to allow for any changes to the original specification. Any savings or overruns between target cost and actual cost at completion are shared between the parties to the contract with a pre-determined share ratio set out in the contract.*”

In Hong Kong, the Mass Transit Railway Corporation (2003) explained TCC principle in that “*the client and the contractor would share savings (gains) if the final actual cost of completing the work turns out to be less than the target cost. Should the final out-turn cost exceed the target cost, they would share the excess (pain)*”. TCC is therefore a unique arrangement that shifts the fixed price approach to a target cost approach based on joint determination and agreement between the client and the contractor on the allocation of shared risks. This form of procurement method is much more than a form of contract setting out the rights and obligations of the contracting parties. It is a method of working that requires both the client and the contractor to work together more closely than they would under most other contractual arrangements, to manage the costs of the work for mutual benefit (Longley, 2006).

Figure 1 graphically illustrates the definition and operational mechanism of TCC contracts. Under the operational strategy of TCC, an agreed target price and a gain-share/pain-share mechanism of a project are thereby established in the construction contract under this agreement (Clough and Sears, 1994; Cantirino and Fodor, 2003). The contractor usually includes a sum for future design development and for unforeseeable risks (Gander and Hemsley, 1997). Figure 2 provides a hypothetical example to demonstrate the implementation of this gain-share/pain-share philosophy for TCC construction projects.

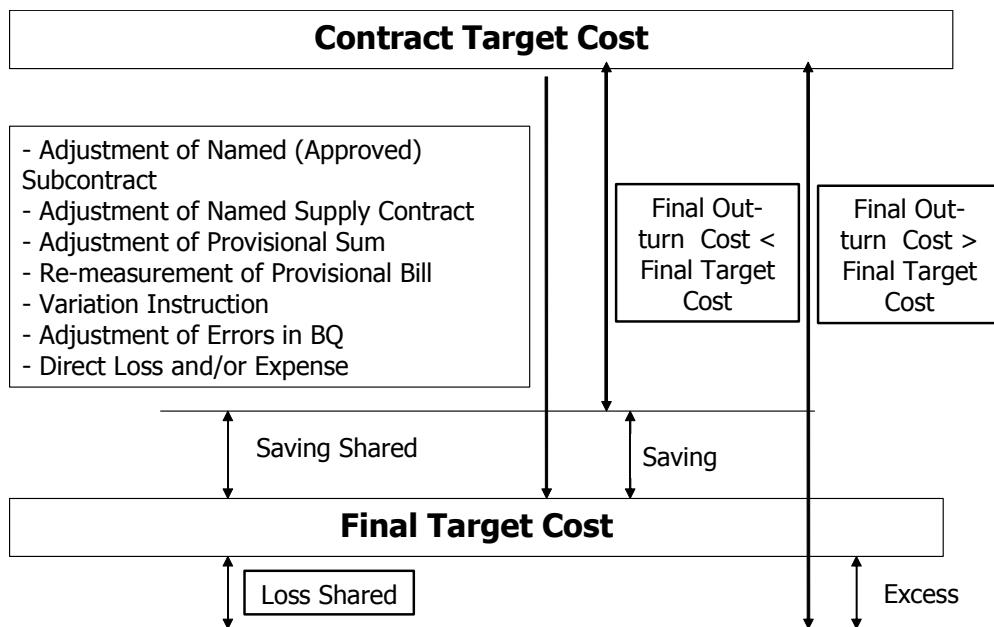


Figure 1. Operational mechanism of TCC procurement strategy [Adapted from Cheng (2004)]

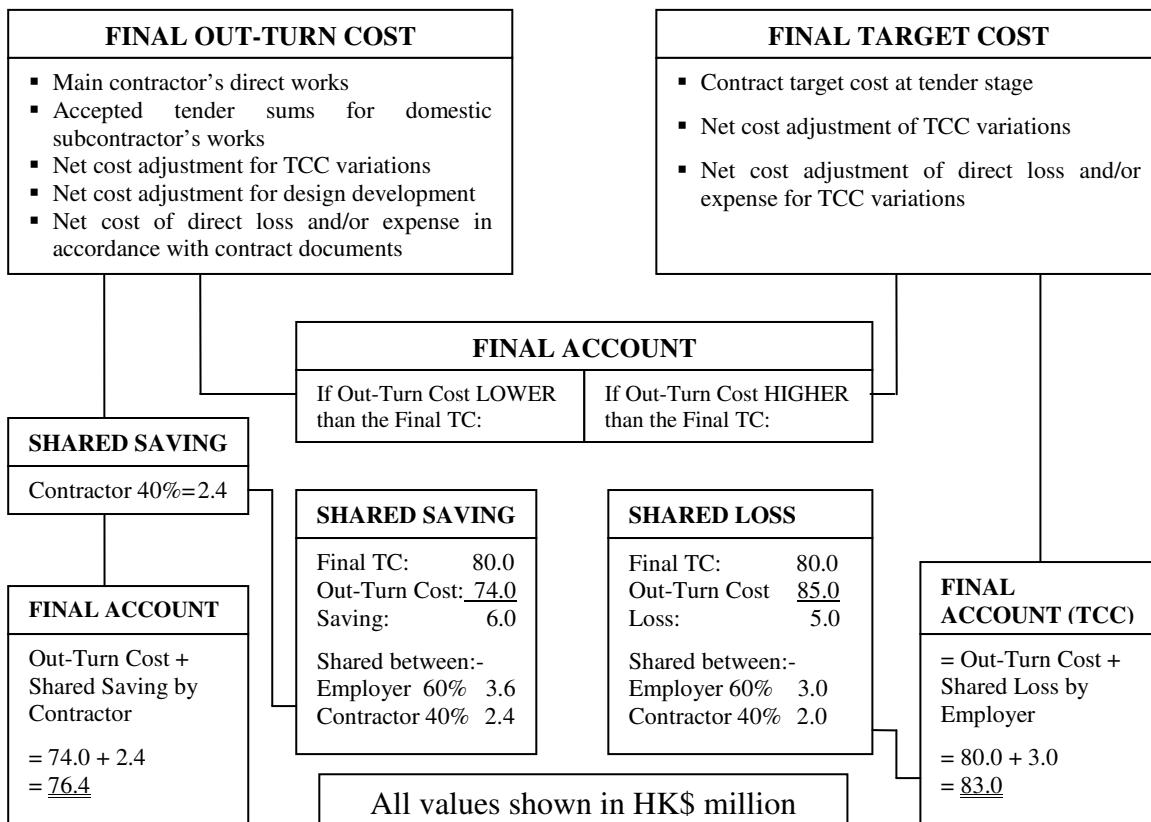


Figure 2. A hypothetical example for illustrating the gain-share/pain-share mechanism of the TCC procurement approach [Adapted from the Hong Kong Housing Authority (2006)]

Literature review of TCC key features

An extensive review of contemporary literature was initially undertaken to investigate the underlying motives, perceived benefits, potential difficulties and critical success factors of the TCC methodology by the same research team (Chan *et al.*, 2007a; Chan *et al.*, 2007b) with their highlights provided below.

Under the target cost contracts, the gain-share/pain-share mechanism offers strong financial incentives for the contractor to work efficiently and to achieve cost saving (Boukendour and Bah, 2001; Fan and Greenwood, 2004). Another possible advantage of implementing TCC is the improvement of construction quality. Conventional contracting methods may over-emphasise on price and sacrifice quality (Cheng, 2004). In sharp contrast, the TCC sets an agreed reasonable target price and facilitates the tendering of the

domestic subcontractors' works packages on an open basis, which ensures that the employer receives competitively priced tenders from approved subcontractors and specialists (Tay *et al.*, 2000). This contracting approach therefore helps in selecting the right project team which has gained adequate experience and is capable to develop the client's design intent (Trench, 1991). This form of procurement arrangement also eradicates the multi-layered subcontracting and maintains the quality standards of constructed facilities and workmanship.

However, the major problem encountered whilst implementing the TCC approach may be the unclear definition of a scope change (Gander and Hemsley, 1997), causing potential disputes with the natural tendency of the client and contractor pulling in opposite directions to achieve their own objectives (Tay *et al.*, 2000; Fan and Greenwood, 2004). The scope of contractor's work, therefore, has to be clearly defined in the client's project brief (Tang, 2005). Sadler (2004) added that scope changes/variations need to be kept to a minimum in order that the TCC contract can be administered as intended and that the approach might provide value for money in construction.

A TCC scheme, like other standard cost-based contracts, usually requires that details of the contractor's tender pricing for any TCC subcontract works packages be made fully available to the client through an "open-book" accounting arrangement. The contractor's project accounts must be open for scrutiny by the client, and the client must satisfy himself that the contractor's supporting staff on-site will include a strong administrative team and an accountant experienced in this procedure. The clients pay these costs to the contractor, subject to satisfactory checks of constructed facilities. The use of open-book accounting regime enables better accountability and quantification of the costs of risk (National Economic Development Office, 1982).

Additionally, the TCC form of procurement requires a greater level of commitment and involvement by all project parties to the contract arising from tendering, not only for the main target cost contract, but also individually for the domestic subcontractor's works packages (Tang and Lam, 2003). Furthermore, TCC is still a new concept within the local construction industry. Project participants might not be used to working in this novel way and may find it uncomfortable and difficult to change the traditional working style (Sadler, 2004). The National Economic Development Office (1982) stressed that the successful

implementation of target cost contracts depends on a sound understanding by both the client and contractor of the principles underlying the procurement approach, and of the roles and relationships brought about by the use of this form of contract.

Tay *et al.* (2000), on the other hand, postulated that there must be a genuine willingness to achieve co-operation or demonstrate partnering spirit between the contracting parties. This enables project participants to work together towards common goals and generate a teamwork culture to resolve disputes and to complete the project without having to revert to protracted contractual claims requiring litigious resolutions. A clear and fair allocation of risks between employer and contractor is thus vital (Mills and Harris, 1995). It is also imperative to tap in the expertise of the main contractor and suppliers during the design stage and before the design is finalised (Sadler, 2004). This enables technical advice on buildability and environmental issues to be integrated into the design by the contractor.

Research methodology

The overall research methodology comprises an in-depth case study of TCC. Yin (1981) defined a “case study” as an empirical inquiry that (1) investigates a contemporary phenomenon within its real-life context; (2) is appropriate when the boundaries between phenomenon and context are not clearly evident; and (3) incorporates multiple sources of evidence. Case studies are suitable for projects that are significant (Yin, 2009). The selected TCC project under scrutiny is a challenging underground railway station modification works in Hong Kong with a huge risk profile and tight schedule for completion. The major findings derived from this case study can assist in reaping the perceived benefits and exploring the implementation process of TCC contracts for achieving construction excellence for future projects.

Two senior representatives from the client organisation (Mass Transit Railway Corporation Ltd) were interviewed in April of 2007 to collect in-depth information and data of the project and to solicit the perceptions of the underlying motives, benefits, difficulties and success factors of TCC based on the chosen case. Target interviewees from the main contractor organisation (Kumagai Gumi Co Ltd) could not be contacted due to the departure of the staff members concerned after project completion in September 2005. Each interview was launched at the interviewee’s office and lasted for about 1.5 hours.

One of the interviewees was the General Manager (Procurement and Contracts) and the other the Contracts Administration Manager (Operations) of the Mass Transit Railway Corporation Ltd. Both of them were well-experienced in construction contracting and heavily involved in the TCC procurement process of the selected project. Copies of relevant materials including the project's scope of work, contract terms on TCC, in-house guidelines or best practice framework for implementing the TCC scheme, case reports, as well as on-line website materials were obtained as the secondary source of evidence to support primary opinions and information gleaned during the interviews.

Since the two target interviewees were senior industrial practitioners having abundant experience with TCC schemes, the interviews were flexibly structured to facilitate free flow of ideas. The following open-ended questions were asked to convey a general idea of the information solicited, while the interviewees were encouraged to express their views on the subject, without being restrained by the preset questions related to the studied case:

1. What is the implementation mechanism or current practice framework adopted for the TCC methodology?
2. What are the motives behind the decision to implement TCC instead of traditional fixed-price lump-sum contract?
3. What are the major benefits and difficulties in adopting TCC?
4. What are the essential elements for successful TCC scheme?

The information acquired from the interviews was first audio-recorded and later transcribed into written dialogues. The draft interview dialogues were forwarded to corresponding interviewees subsequently via email transmission for verification. A systematic account of information obtained from in-depth interviews was archived for subsequent analysis. Outcomes derived from the analysis of interview dialogues were cross-referenced to the literature review and triangulated with each other for validation.

Case study: Tsim Sha Tsui Underground Railway Station Modification Works

Background of the project

A comprehensive search of the background information and data regarding the selected project case was launched based on some seminar papers (Dunn and Jones, 2004; Avery, 2006), together with online materials (Hong Kong Construction Innovation, 2006). The Tsim Sha Tsui (TST) Underground Railway Station Modification and Extension Works project was the first fully “open-book” target cost contract in Hong Kong. It attempted to make innovation and value engineering a priority backed by the gain-share/pain-share formula of the TCC process. The contract involved the connection of the pedestrian subway links of the new Kowloon-Canton Railway Corporation (KCRC)¹ East Tsim Sha Tsui Station to the existing Mass Transit Railway Corporation Ltd (MTRCL) Tsim Sha Tsui Station at the south end, and to improve passenger access and egress at the north end. The project entailed a single level extension to one end of the existing underground structure. The key objectives of the works were (Hong Kong Construction Innovation, 2006):

- (1) to build subways linking to East Rail and forming an integral part of the Tsim Sha Tsui subway network for the commuters;
- (2) to relieve congestion and to improve station accessibility because of the increase in passengers and new commercial developments in the area;
- (3) to provide a better travelling environment for passengers; and
- (4) to provide convenient station access for passengers with special needs by constructing a passenger lift.

This extension was constructed beneath Nathan Road, a major trunk road in one of the busiest districts of Hong Kong, within a cut and cover cofferdam. Other station modifications entailed significant alterations to the existing station structure whilst maintaining passenger flows at all times. The project consisted of deep excavation and pedestrian subway construction within a busy urban area. The excavation for the subway was as close as 1.5m above the crown of an operating underground railway tunnel and the temporary retaining structures at a similar distance from the side of the tunnels. The works were therefore executed with a high level of construction risk. Risk management and mitigation became an extremely critical issue to the success of this project. Apart from the MTRCL as the client organization and project manager, the project team was also

¹ KCRC merged with MTRCL in December 2007 and the Hong Kong SAR Government maintains a majority stake in the MTRCL.

composed of a Japanese main contractor, an electrical and mechanical engineering consultant, and various specialist subcontractors (e.g. instrumentation, cladding, steelwork, ceiling, etc).

Motives behind introducing TCC

The experience of an earlier Tseung Kwan O Underground Railway Extension (TKE) project has proved that the implementation of incentivisation agreement (IA) is beneficial to the overall project performance. IA is analogous to TCC in principle, where the client and the contractor mutually agreed at the start date that all remaining works from this agreed date will be calculated with an estimated cost for their risks with the gain-share/pain-share arrangement. The advantage of IA lies in the incentives to make the contractor work efficiently and achieve cost saving. MTRCL considered that it would be a sensible decision to introduce incentive schemes to the Tsim Sha Tsui Underground Railway Station Modification and Extension Works project as well. After several rounds of searching and reviewing, the mechanism of a fully open-book target cost contracting scheme using the gain-share/pain-share philosophy was developed, with the purpose of achieving excellent project performance. The client also intended to implement this project as the benchmark model for their future target cost-based construction projects, especially those large-scale technically difficult contracts (e.g. West Island Underground Railway Line).

Another conspicuous reason for introducing the TCC approach to the case study project was to provide financial incentives for the contractor to contribute and save cost by offering innovative ideas. Given the substantial uncertainties and the high risk profile of the project, adopting the traditional fixed-price lump-sum contract might result in a plethora of claims and poor working relationship amongst contracting parties. The implementation of TCC scheme through the gain-share/pain-share mechanism would achieve better certainty on time, cost and quality to the client and help encourage the contractor to focus on the management and mitigation of risks inherent with the project.

In addition, it was intended to vastly improve the working relationships and bring in a more co-operative approach to conflict resolution. The client wished to align the overall project stakeholders' objectives by providing the best overall solutions without

compromising the safety and operation of the railway while striking a realistic balance between the programme and total project cost (Dunn and Jones, 2004). Claims were also expected to be minimised via this alternative integrated procurement strategy.

Tendering process and key features of TCC contract

The main contract was awarded through a two-stage tendering process. At stage one, a total of seven pre-qualified contractors were invited to submit their tenders, consisting of a detailed technical proposal and a fee proposal with schedule certainty. A two-envelope tender assessment method was adopted for the development of a detailed proposal used for assessment at stage two. Adjudication mainly focused on the quality of the technical submission and achievement of the proposed schedule. Two potential contractors were shortlisted to the second stage whilst the unsuccessful contractors were reimbursed for administration expenses.

The two shortlisted contractors were given three months and full access to the design team, with the aim of optimising the technical side of the scheme to achieve the best overall solutions. This included a value engineering exercise, a full-scale risk analysis and prudent consideration of all schedule issues to ensure the achievement of the target completion date. In parallel, the contractors were involved in the analysis and estimation of the target price for the contract. Subsequently, a senior management team of MTRCL adjudicated on the final proposals against a full marking regime to award the contract.

Under the TCC arrangement, the client described the tender price quoted by the contractor as the initial target cost. During the contract execution stage, the contractor was paid the actual construction cost for the work done. A sum of money was set aside based on the risk quantification exercise as a contingency pool. Savings arising from the innovation, value engineering initiatives, management and mitigation of the shared works would go into the pool. However, any revision to the initial target cost due to the construction programme has to be agreed between the client and the contractor when the impacts and consequences of the instructions have been determined (Wong, 2006). A gain/pain share ratio between the client and the contractor was agreed at the early stage of the project. Consequently, the gain or pain within the pool at the end of the contract would be shared on a 50:50 basis as portrayed in Figure 3.

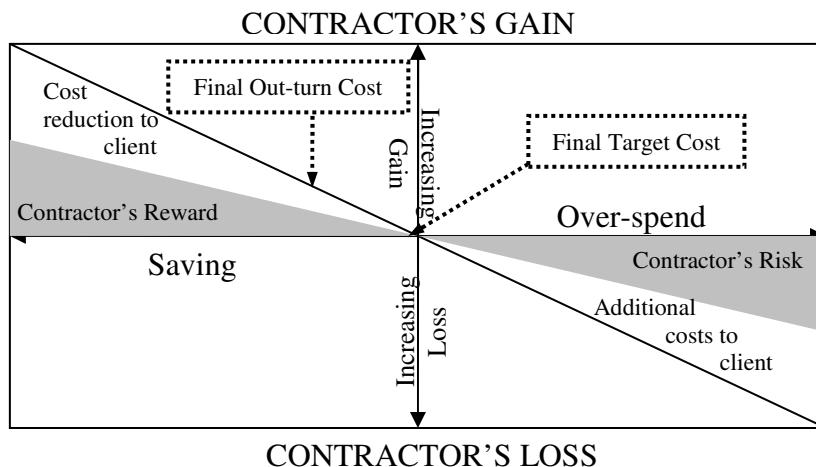


Figure 3. The gain-share/pain-share arrangement for the Tsim Sha Tsui Underground Railway Station Modification and Extension Works [Adapted from Avery (2006)]

The target cost contract operated by the client was on an “open-book” gain-share/pain-share basis. The contractors were given specific instructions on areas of the bid where the costs were fixed and in particular the contractor’s preliminary costs. The addition for overhead and profit was fixed as a percentage at the outset. Based on a joint risk assessment conducted at tender stage, risks were reasonably allocated and suitable contingencies were identified, i.e. where the contractor accepted full responsibility for specific risks he would need to ensure that a suitable contingency was included in the tender price. For the client’s accepted risks, the TCC may be altered up or down based on a valuation of the risk impact.

Measurement of time and cost performance

Although the risk profile was enormous and the period for completion was exceptionally tight, the project was successfully completed in terms of both time and cost. The contract value of the project was initially set at HK\$300 million² as at April 2002 price with a contract period of 36 months. The final target cost³ had risen by HK\$12.5 million to HK\$312.5 million to take account of a number of variations. The final out-turn cost⁴ was contained to HK\$297.7 million, which produced a gain share pot of HK\$14.8 million

² Exchange rate: GBP1 = HK\$15.50 as at April 2002 price

³ Final target cost: The initial target cost plus the target cost variations

⁴ Final out-turn cost: The expenditures on the project under pre-defined and permissible categories, actually incurred by the main contractor

(about 5% of cost saving). The time and cost profiles of the project are depicted in Figure 4. The project was successfully completed in September 2005, i.e. seven months earlier than the contract completion date (about 20% of time saving). This case study effectively justified the use of alternative integrated contracting strategies that best align the project team's ability to the risk profile of the project (Avery, 2006).

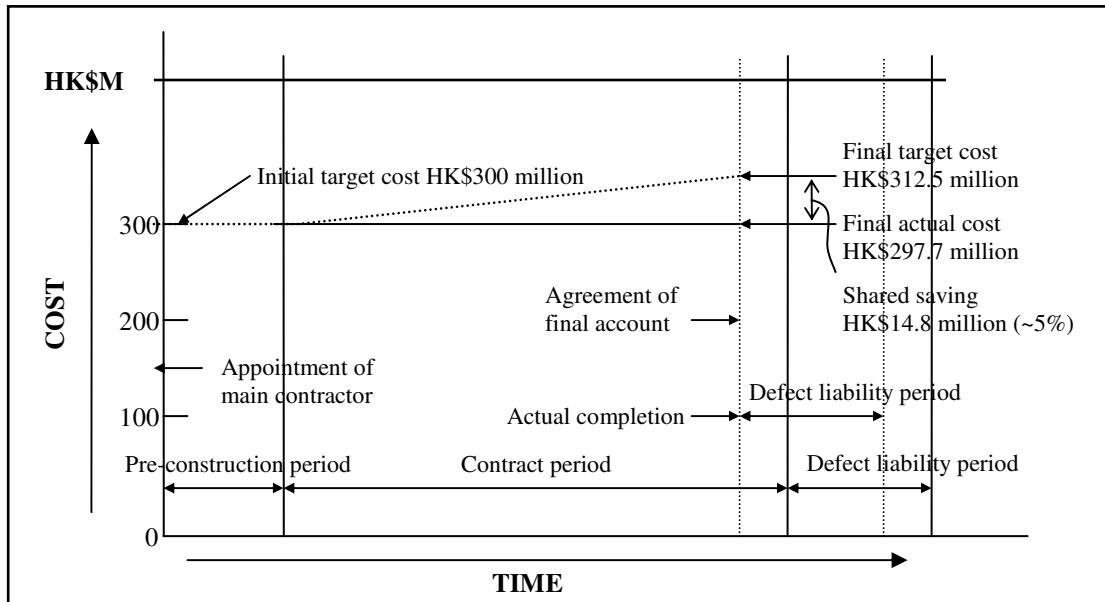


Figure 4. The cost and time profiles of the Tsim Sha Tsui Underground Railway Station Modification and Extension Works [Adapted from Avery (2006)]

Key benefits of adopting TCC

The interviewees stressed that the target cost contracting scheme exercised more rigorous control over the tendering process, subcontract procurement, risk management, contract administration, as well as higher transparency for financial control and higher quality of information required for forward financial planning. These significantly contributed to the excellent project performance of the Tsim Sha Tsui Underground Railway Station Modification Works. In particular, through a proper performance-based remuneration, the contractor's financial interests and those of the client become more closely collaborative and it is in the financial interests of both contracting parties to co-operate (Wong, 2006).

The introduction of the gain-share approach, and more importantly the pain-share arrangement which is absent from the guaranteed maximum price (GMP) contracts, helped align the individual objectives of various project stakeholders to the overall objectives of

the project, and establish harmonious working relationships within an integrated project team. The agreements arose from the TCC contract and partnering initiatives that encouraged the client and the contractor to manage works together and shared any consequent benefits and losses. Project participants responded that more opportunities are available for them to express opinions and concerns openly and freely under the TCC arrangement. Ting (2006) also opined that the incentivisation agreement can create a more proactive, co-operative working atmosphere amongst the contracting parties and reinforces the cultural shift away from the traditional, adversarial approach to contracting.

One profound advantage of the TCC approach in this project lies in the incentive to the contractor to work efficiently and to achieve cost saving, resulting in better value for money for the entire project development as advocated by Boukendour and Bah (2001). Expertise in project designs and innovations in both construction methods and materials were brought in from contractor to enhance the buildability of the project (Lam, 2002). Furthermore, a more equitable risk apportionment amongst project participants was offered when compared with the traditional procurement approach. The project required early involvement of the contractor in the design phase to assist in the identification and apportionment of risks (Dunn and Jones, 2004). The application of “open-book” accounting regime also enabled quantification of the risks and prevented the project risks from causing adverse effects on the contractor’s cash flow (Wong, 2006).

Major difficulties in implementing TCC

Subsequent to the decision of applying TCC to the selected project case, the rationale behind had to be explained to the directorate of MTRCL and the Hong Kong SAR Government as the major stakeholder. However, obtaining endorsement from the directorate was very demanding (Avery, 2006). Faced with a high risk profile of the project, the usual solution in Hong Kong would be a design-and-build lump-sum contract with the entire risks being passed onto the contractor. The difficulty was compounded primarily because a fully cost reimbursable target cost contract with the gain-share/pain-share formula was unheard of in Hong Kong at that time. The TCC concepts were accepted by the management as it was assured that the issue of cost reimbursement would be monitored closely.

At tender stage, the project lacked a suitable form of contract for TCC within the MTRCL internal standard contract agreements. There was also a prime concern about the use of an unfamiliar form of contract such as the Engineering and Construction Contract. Changes were thus made to an existing MTRCL standard contract. As discussed by Sadler (2004), project participants might not be used to working in this novel way and may find it uncomfortable and difficult to change the traditional way they work. Gander and Hemsley (1997) also stated that the absence of standard form of TCC contract would result in a greater possibility of drafting errors and misunderstanding of liabilities between various contracting parties. During the construction stage, disputes arose because Architects / Engineers Instructions arbitrarily constituted target cost variations or were deemed to be classified as design development due to unclear scope of work (Chan *et al.*, 2007b). However, adjudication meetings involving representatives from the client, engineer and main contractor were launched together with the partnering facilitator and relevant contracting parties to resolve controversial issues and intractable disputes.

Critical success factors for TCC

Interviewees shared a unanimous view that the overall project success was contributed by the fairly good working relationships amongst various project stakeholders and the target cost procurement approach, which had assisted in establishing mutual objectives, common interests and an open-book accounting environment. A partnering consultant was appointed to facilitate the team building, enhance communication amongst the project team members and to monitor project progress on a regular basis. Building integrated and committed teams can facilitate the accomplishment of smooth project delivery as well as an equitable risk sharing mechanism. The application of a “shared” site office for the whole project team further catalysed the communication and integration amongst the contracting parties under a teamwork culture. Tay *et al.* (2000) stressed that for a target cost contract to be successful, there must be a genuine willingness to achieve co-operation or demonstrate partnering spirit between the collaborating parties.

A right selection of project team is therefore essential in facilitating mutual trust, effective communication, efficient co-ordination and productive conflict resolution (Chan *et al.*, 2004). Under the TCC arrangement of this project case, the client was involved in subcontractor selection and a similar target cost contractual arrangement had also been

entered into for the mechanical and electrical subcontractors. Strong leadership and proactive contractor was also of paramount importance to deal with any unexpected issues and potential disputes, and the choice made by all involved would either make or potentially break the strategy and the processes necessary for real success (Avery, 2006).

Another significant element of the TCC procurement strategy was the transparency of the entire project development process. The project stakeholders decided from the outset that there was to be one set of records for the project team and this was implemented since the initial project stage. Mutual trust and close working relationship were therefore critical in accomplishing the “open-book” accounting regime. In addition, because of this unique arrangement of the target cost approach based on joint determination and agreement between the client and the contractor on the allocation of shared risks, the client recognised the essence of realistic target cost estimates, which would include appropriate risk contingencies under the pain-share/gain-share mechanism.

Sadler (2004) recommended that clients should evaluate the combination of fee and share not only the risks fairly, but also to ensure that the incentive is of sufficient value to motivate the contractor. Perry and Barnes (2000) put forth a strong case for avoiding setting the contractor’s share at less than 50%. Tang and Lam (2003) proposed various percentages of shares for target cost-based contracts between the client and the contractor depending on the extent of cost saving achieved as indicated in Table 1. Broome and Perry (2002) further suggested that an appropriate contracting strategy should aim to align the motivations of the parties so as to maximise the likelihood of project objectives being achieved, taking account of the constraints and risks that act on the project and the strengths and weaknesses of the parties participating in it. However, different contract and incentive structures are required to meet differing project objectives and circumstances (Bower *et al.*, 2002).

Summary of lessons learned

Based on the above qualitative analysis on the case study, the major interview findings are summarised in Table 2.

Table 1. Suggested share saving percentage apportionment for target cost-type contracts
[Adapted from Tang and Lam (2003)]

Scenario	Client's share	Contractor's share
Final out-turn cost < Final target cost		
(a) Saving < 5%	67%	33%
(b) Saving = 5-10%	50%	50%
(c) Saving > 10%	33%	67%

Table 2. Summary of the primary attributes associated with TCC scheme for the Tsim Sha Tsui Underground Railway Station Modification and Extension Works

Project nature	Underground railway station modification and extension works involving the connection of the pedestrian subway links in Tsim Sha Tsui, Kowloon, Hong Kong
Contracting approach	Target Cost Contracting (TCC) approach using two-stage tendering process
Gain-share arrangement	Client : Contractor = 50 : 50
Pain-share arrangement	Client : Contractor = 50 : 50
Underlying motives	<ul style="list-style-type: none"> ▪ To achieve excellent project performance ▪ To generate financial incentives for the contractor to contribute and save cost by offering innovative ideas ▪ To improve working relationship through partnering spirit ▪ To introduce a more co-operative approach to conflict resolution and minimise claims ▪ To align individual objectives of various contracting parties with the overall project objectives
Key benefits	<ul style="list-style-type: none"> ▪ Provision of financial incentives for contractor to work efficiently and to achieve cost saving ▪ More rigorous control over tendering process, subcontract procurement, risk management and contract administration ▪ Higher transparency for financial control and higher quality of information exchange ▪ Harmonious working relationship within the project team via partnering arrangement ▪ Development of common overall project goals amongst various project stakeholders ▪ Enhanced buildability of project design ▪ More equitable risk apportionment between client and contractor
Major difficulties	<ul style="list-style-type: none"> ▪ Unfamiliarity with or misunderstanding of TCC concepts and practices by senior management

	<ul style="list-style-type: none">▪ Lack of a suitable form of contract for TCC in the local context▪ Dispute (claim) occurrence due to unclear scope of work in client's project brief
Critical success factors	<ul style="list-style-type: none">▪ Good working relationship and right selection of project team▪ Shared objectives with common interests▪ Open-book accounting arrangement in support of tender pricing by contractor▪ Strong leadership and proactive contractor▪ Transparency of the entire project development process

Conclusions

Target cost contracting (TCC) scheme aims to develop a co-operative teamwork spirit based on a partnering working relationship, which has been globally recommended as an appropriate means of realising high risk construction projects. To provide sufficient groundwork for construction clients to establish a best practice framework for TCC scheme in future construction projects, this study has reported on the TCC form of procurement strategy via a triumphant project in Hong Kong: the “Tsim Sha Tsui Underground Railway Station Modification and Extension Works”. The TCC applications and key features, motives, benefits, difficulties and success factors of implementing the TCC scheme are explored and discussed through a couple of face-to-face interviews with senior representatives from the client organisation.

The target cost-type procurement approach derives a multitude of benefits to the delivery of the selected project case, including cost incentives for contractor to work efficiently and aligning individual objectives of various project stakeholders with the overall project objectives due to the presence of a gain-share/pain-share mechanism. Its essence and operational framework is worthy of industry-wide attention, and project participants could be bestowed full benefits from its implementation. An evaluation of the TCC case study project is likely to lead to a better appreciation of TCC practices and to generate essential strategies to alleviate the root causes of poor project performance and the win-lose consequence. Although the implementation practices reported from the case study represent findings which are primarily related to Hong Kong, the research outcomes and lessons learned on the perceptions and the assessment of project performance are valuable to key project stakeholders in overseas countries as well for their implementation of TCC schemes in future construction projects.

In order to obtain a more balanced overview of the success/failure of the case project, it is recommended that more in-depth interviews with other contracting parties (e.g. main contractor, mechanical and electrical engineering consultant and the team of trade subcontractors) should be launched to solicit their perceptions and feedback on the TCC arrangement. The case study findings are particularly useful in developing best practices and generating effective practical guidelines or strategies for the successful implementation of target cost contracts for the construction industry, both locally and overseas. Further research can be planned to investigate more TCC case studies in future to confirm the underlying motives, perceived benefits, potential difficulties and essential successful ingredients as determined from this study. In addition, future research is recommended for comparing the performance of projects procured using TCC and performance-based contracting (PBC) options between the construction industry and other industries such as the logistics field and service sector in order to produce best practice guidelines for implementation.

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References

- Avery, D. (2006), "How collaborative commercial strategies give certainty to the delivery of major railway infrastructure projects", *PMICOS 2006 Annual Conference*, 23-26 April 2006, Orlando, Florida, USA.
- Boukendour, S. and Bah, R. (2001), "The guaranteed maximum price contract as call option", *Construction Management and Economics*, Vol. 19 No. 6, pp. 563-567.
- Bower, D., Ashby, G., Gerald, K. and Smyk, W. (2002), "Incentive mechanisms for project success", *Journal of Management in Engineering*, ASCE, Vol. 18 No. 1, pp. 37-43.
- Broome, J. and Perry, J. (2002), "How practitioners set share fractions in target cost contracts", *International Journal of Project Management*, Vol. 20 No. 1, pp. 59-66.
- Cantirino, J. and Fodor, S. (1999), "Construction delivery systems in the United States", *Journal of Corporate Real Estate*, Vol. 1 No. 2, pp. 169-177.
- Chan, A.P.C., Chan, D.W.M., Chiang, Y.H., Tang, B.S., Chan, E.H.W. and Ho, K.S.K. (2004), "Exploring critical success factors for partnering in construction projects", *Journal of Construction Engineering and Management*, ASCE, Vol. 130 No. 2, pp. 188-198.
- Chan, A.P.C. and Yung, E.H.K. (2003), *Procurement Selection Model for Hong Kong*, 2nd Edition, Research Monograph, Department of Building and Real Estate, The Hong Kong Polytechnic University, 143 pages, ISBN 962-367-285-3.
- Chan, D.W.M., Chan, A.P.C., Lam, P.T.I., Lam, E.W.M. and Wong, J.M.W. (2007a), *An Investigation of Guaranteed Maximum Price (GMP) and Target Cost Contracting (TCC) Procurement Strategies in Hong Kong Construction Industry*, Research Monograph, Department of Building and Real Estate, The Hong Kong Polytechnic University, 152 pages, ISBN 978-962-367-593-2, October 2007.
- Chan, D.W.M., Chan, A.P.C., Lam, P.T.I., Lam, E.W.M. and Wong, J.M.W. (2007b), "Evaluating guaranteed maximum price and target cost contracting strategies in Hong Kong construction industry", *Journal of Financial Management of Property and Construction*, Vol. 12 No. 3, pp. 139-149.
- Cheng, R.L.L. (2004), *Investigation of the Application of Guaranteed Maximum Price in the Hong Kong Construction Industry*, Unpublished BSc(Hons) Dissertation in Construction Economics and Management, Department of Building and Real Estate, The Hong Kong Polytechnic University, Hong Kong, 58 pages.

- Construction Industry Review Committee (2001), *Construct for Excellence*, Report of the Construction Industry Review Committee, Hong Kong SAR, 207 pages.
- Clough, R.H. and Sears, G.A. (1994), *Construction Contracting*, 6th Edition, New York, Wiley-Interscience Publication.
- Dunn, M. and Jones, R. (2004), “The Tsim Sha Tsui experience – an update”, *Seminar on Collaboration not Confrontation in Executing Construction Contracts* organised by the Lighthouse Club, 21 May 2004, Hong Kong Convention and Exhibition Centre, Hong Kong.
- Fan, A.C.W. and Greenwood, D. (2004), “Guaranteed maximum price for the project?”, *Surveyors Times*, The Hong Kong Institute of Surveyors, March, pp. 20-21.
- Gander, A. and Hemsley, A. (1997), “Guaranteed maximum price contracts”, *CSM*, January, pp. 38-39.
- Hong Kong Construction Innovation (2006) Innovation Bank, *Hong Kong Demonstration Projects Committee*, available at: <http://www.hkci.org> (accessed on 4 September 2006).
- Hong Kong Housing Authority (2006), *Internal Guidelines for Guaranteed Maximum Price Contract Procurement Based on Private Sector Model*, The Hong Kong Housing Authority, Hong Kong SAR Government, 19 pages.
- Lam, P.T.I. (2002), “Buildability assessment: The Singapore approach”, *Journal of Building and Construction Management*, Hong Kong, Vol. 7 No. 1, pp. 21-27.
- Longley, S. (2006), “Target price contracts and how to make them work”, article available from SL Consulting at: <http://www.sl-consulting.com> (accessed on 4 September 2006).
- Masterman, J.W.E. (2002), *Introduction to Building Procurement System*, 2nd Edition, London New York Spon Press.
- Mills, R.S. and Harris, E.C. (1995), “Guaranteed maximum price contracts”, *Construction Law*, 573/95, pp. 28-31.
- Mass Transit Railway Corporation (2003), *The Tseung Kwan O Extension Success Story*, Mass Transit Railway Corporation Ltd, Hong Kong, 133 pages.
- National Economic Development Office (1982), *Target Cost Contracts – A Worthwhile Alternative*, Civil Engineering Economic Development Committee, National Economic Development Office, UK: London.
- Perry, J.G. and Barnes, M. (2000), “Target cost contracts: an analysis of the interplay between fee, target, share and price”, *Engineering, Construction and Architectural Management*, Vol. 7 No. 2, pp. 202-208.

- Sadler, M.C. (2004), *The Use of Alternative Integrated Procurement Approaches in the Construction Industry*, Unpublished MBA Dissertation in Construction and Real Estate, Department of Construction Management and Engineering, University of Reading, UK, 132 pages.
- Tang, S.L. and Lam, R.W.T. (2003), “Applying the target cost contract concept to price adjustments for design-and-build contracts”, *Hong Kong Engineer*, September, pp. 18-19.
- Tang, W.Y. (2005), *An Evaluation of the Success and Limitations of Guaranteed Maximum Price in the Hong Kong Construction Industry*, Unpublished BSc(Hons) Dissertation in Construction Economics and Management, Department of Building and Real Estate, The Hong Kong Polytechnic University, Hong Kong, 41 pages.
- Tay, P., McCauley, G. and Bell, B. (2000), “Meeting client’s needs with GMP”, *The Building Economist*, June 2000, pp. 4-5.
- Ting, W. (2006), *The Impact of the Interdisciplinary Efforts on the Receptivity of Guaranteed Maximum Price (GMP) Project*, Unpublished MSc in Inter-disciplinary Design Management Dissertation, Department of Real Estate and Construction, The University of Hong Kong, Hong Kong, 97 pages.
- Trench, D. (1991), *On target – A Design and Manage Target Cost Procurement System*, London Thomas Telford.
- Wong, A.K.D. (2006), “The application of a computerised financial control system for the decision support of target cost contracts”, *Journal of Information Technology in Construction (ITcon)*, 11 (Special Issue on Decision Support Systems for Infrastructure Management), pp. 257-268.
- Yin, R.R. (1981), “The case study as a serious research strategy”, *Knowledge: Creation, Diffusion, Utilisation*, 3, pp. 97-114.
- Yin, R.R. (2009), *Case Study Research: Design and Methods*, 4th Edition, Sage Publications, Thousand Oaks, California, USA.

Corresponding author

Daniel W.M. Chan can be contacted at: bsdchan@inet.polyu.edu.hk