

Evaluation of Interface between Main Contractor and Subcontractors during Procurement and Construction Stages for Successful Project Implementation

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Abstract

Despite government initiatives for improving the construction industry's performance and emphasis on integration of processes and building close relationships across companies, little progress has been made especially further down the supply chain. As there has been increased dependence on subcontracting within the construction industry, the operational relationship between the Main Contractor (MC) and Subcontractor (SC) plays a significant role in successful delivery of projects. Through the literature review this paper argues despite the fact that SCs bring added value to construction projects, the increased reliance on SCs has strained relationships between the MC and SC. Also MCs are more concerned with risk and price reduction which undermine the relationship heavily. Current practices in the construction industry in managing SCs were evaluated through a case study and semi-structured interviews. An online questionnaire was used to investigate the ways of facilitating the interface between the MC and SC in general. One of the key factors influencing the interface adversely was attributed to poor management practices from the MC. Trust and honesty were regarded as key factors in the MC/SC relationship for successful project outcomes.

Keywords: construction, interface management, main contractor and subcontractor relations.

Introduction

The construction projects have become more complex and challenging owing to the technical advances, tighter regulations and need for effective management of resources for competitive edge. With the increased complexity of construction projects, the role of Subcontractor (SC) has been dominant in the construction project under the leadership of MCs. The Main Contractor (MC) concentrates efforts towards organisational management to meet the needs of the client while the SC specialises in particular project aspects to meet the needs of the MC (Jamieson *et al*, 1996). Artto *et al*, (2008) emphasised that the MC needs to focus on inter-organizational relationships and not just focus on the individual SC's capabilities. The influential reports of Latham (1994) and Egan (1998) suggested ways for improving construction industry performance and emphasised a need to focus on integration of process across companies, and on building close relationships. It is acknowledged that some of the principles outlined in the reports, have made little or no change, especially further down the supply chain. Wolstenholme *et al* 2009 highlight that radical change required by construction industry has not been fully implemented despite

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some minor changes have been realised. It is widely accepted that the relationships between the MC and SCs having a significant effect on the success of the project, but, the topic of the SC management has been neglected (Moody, 2008) as well as the key operational interface between the MC and SCs has been undermined (Humphreys *et al*, 2003). SCs generally operate within certain geographic radius which restricts bidding opportunities made available by limited MCs. The SCs are likely to continue to receive requests for future projects by maintaining good relations with the MCs (McCord, 2010).

The MC/SC interface is often dealt with less sophistication and is generally unequal between the parties given the dependence of the SC on the MC for work (Odeyinka and Kelly, 2009). During the procurement stage, roles and responsibilities of the SC are defined but many issues arise during construction, often affecting project continuity. This paper argues that early involvement of SCs and communication and co-ordination established during the procurement stage will create a better working relationship with MC and the SCs throughout the rest of the project.

Review of literature

Various authors presented in Table 1 have highlighted different factors that impact the interface between the MC and SCs in the construction industry. The literature highlights 11 factors, which are: (1) Planning (2) Operational relationships (3) Trust (4) Price (5) Quality (6) Unfair Practices (7) Project Management (8) Communication (9) Dependence (10) Adversarial Relations (11) Complex nature of the Construction Industry.

The planning of subcontracted work is just as important as planning of the MCs own labour and plant. This is because the SC's work impinges on the work of others on site. Realistic planning of the work provides a base, against which pro-active control and reactive control can be carried out to ensure timely completions of the work (Mawdesley *et al*, 1998). Although Ballard and Howell's (2004) analysis revealed that the large majority of plan failures were within the MC control, contradicting traditional assumption that variability was from external causes. Dainty *et al*, (2001a) found that smaller subcontracting companies felt that programming time is becoming unrealistic resulting in poor quality, latent defects and complained of being expected to be flexible with no acknowledgement of their own business requirements. The problems were considered, surprising given the availability of information and communication technology. They concluded no effort had been made to align the systems of SCs with the MCs, or implement the skills needed to avoid such problems.

Bankvall *et al*, (2010) recognised little attention has been paid towards the MC and SC relationships. Artto *et al*, (2008) emphasised that the MC needs to focus on SCs inter-organizational relationships and not just focus on the individual SC's capabilities. Mawdesley *et al*, (1998) stated that it is essential to not only manage the interface between both the MC and the SC but also, between the SCs themselves. The MC and SC relationship needs to be maintained throughout procurement and construction to enable a strong interface within the project team, which signifies a positive move away from the traditional adverse relationships.

Humphreys *et al*, (2003) suggested that a major requirement for success in a MC and SC relationship is trust. While McIvor *et al*, (1997) presented evidence which suggested that a conflict of interests within the MCs organisation could prevent SC integration. Procurement personnel find the area of cost transparency difficult to deal with because open book negotiations are not used for mutual benefit, but used as a method for reducing margins.

The MC has realised the greatest potential for cost savings is through the SC and the prevalence of unfair practices has increased, (Humphreys *et al*, 2003) resulting in dispute

and conflict descending from financial self-interest between various stakeholders within the process.

Table 1: Variables Influencing MC/SC Interface

Variables Text (1) Planning (2) Operational Relationships (3) Trust (4) Price (5) Quality (6) Unfair Practices (7) Project Management (8) Communication (9) Dependence (10) Adversarial Relations (11) Complex Industry											
Variables	1	2	3	4	5	6	7	8	9	10	11
Authors											
Artto <i>et al</i> , (2008)	✓	✓		✓	✓		✓				✓
Ashworth (2006)						✓	✓				
Ballard and Howell (2004)	✓						✓	✓			
Bankvall <i>et al</i> , (2010)	✓	✓						✓			
Briscoe (2001)	✓										
Briscoe (2005)		✓	✓						✓	✓	✓
Cooke and Williams (2004)		✓		✓	✓		✓	✓	✓		
Dainty (2001)	✓	✓	✓		✓	✓	✓	✓		✓	✓
Fearne and Fowler, (2006)		✓						✓		✓	
Fryer (2004)	✓	✓					✓	✓	✓		
Hartmann and Caerteling (2010)			✓	✓	✓		✓				
Humphreys <i>et al</i> , (2003)		✓	✓	✓	✓	✓			✓	✓	✓
Jamieson (1996)										✓	✓
Latham (1994)	✓	✓	✓	✓	✓	✓	✓	✓			
Lossemore <i>et al</i> , (2000)		✓					✓	✓			
Love (2004)	✓						✓	✓	✓		
Matthews (1996)										✓	✓
Mawdesley <i>et al</i> , (1998)	✓	✓		✓			✓	✓	✓		
McCord (2010)		✓					✓		✓		
McGeorge and Palmer (1997)		✓			✓		✓	✓			✓
Miller <i>et al</i> , (2002)	✓	✓	✓	✓			✓			✓	
Muya <i>et al</i> , (1999)				✓			✓	✓		✓	
Odeyinka and Kelly (2009)		✓				✓	✓	✓			✓
Segerstedt & Olofsson (2010)		✓					✓				✓
Thorpe <i>et al</i> , (2003)		✓	✓				✓				
Xie <i>et al</i> , (2010)	✓						✓		✓		✓
Total	11	17	7	8	7	5	19	13	8	8	10

Latham (1994) suggested contractual conditions for SCs were unfair and recommended appropriate contract conditions, based on teamwork principles that can only be achieved if

all the sections of the process are being committed to by the clients, consultants, MCs and SCs. Adverse relationships developed during the tender can result in serious payment problems for Subcontractors (Dainty et al, 2001b). The Construction Act 2009 addresses previous deficiencies complained of in the 1996-1998 Acts, although amended provisions are not straightforward for Subcontractors to gain the most out of the act.

Briscoe *et al*, (2005) discussed that communication exchange and flow requires effective communication systems for ensuring good reliable flows of information. Establishing mechanisms for problem resolution through the tiers of the supply chain will generate added-value into projects. Information technologies (IT) can benefit the construction industry by linking the MC and SC, reducing the response time and enabling companies to expand. However studies have revealed IT is used less in the construction industry compared with other industries. Dainty *et al*, (2001b) converses many SCs complain of an inadequate knowledge management by the MC, causing an impact on the quality of their work.

The literature review highlighted that during the tender assessment the lack of trust between the MC and SC results in time-consuming and costly formalities. During the tender process, negotiations are required to retain the confidence and trust to avoid shortcomings of the SC's tender. The following sections present investigations carried out through a case study, interviews with MC and SC managers as well as a survey of SCs working with a MC.

Case Study

A detailed case study of a live project, the Sea Survival Training Centre (SSTC) (Figure 1) with a project value of £2M was selected. The MC involved specialises in building works with a turnover of £800M, which is part of an international construction group. The SSTC project was procured under the Works Enabling Agreement, which included a wide range of small to medium sized, local SCs. The project documents such as drawings, specifications, contract documents and communications during procurement and construction stages were collected from the MC. A SC involved in roofing and cladding was selected as this work was progressing during the period of study. Detailed information about the processes followed during procurement and construction was elicited from site documents, exploratory discussions, direct observations and participant observations.



Figure 1: Sea Survival Training Centre

The objective of the case study was to carry out an in-depth analysis to establish key variables that need to be managed for a successful project outcome. The variables were investigated further through semi-structured interviews. This was followed by an online questionnaire to triangulate the findings.

Processes involved in the subcontract process

Procurement

The MC put a package together for roofing and cladding and sent out a formal inquiry with drawings, specification and bill of quantities. During the estimating and pricing by the SC, it occurred that some items were not measured on the drawing and hence not included in the bill of quantities. The SC withheld the information about the potential additional items to achieve a competitive price against the bill of quantities. Adversarial relations between the MC and SC were evident through the method of the SC's approach which also revealed lack of trust and total honesty even though the SC was part of MC's supply chain.

Pre-contract Stage

Once the MC had won the project, the SC was asked to clarify the original tender price with the latest fully appraised information. The SC's Managing Director and team leader were invited to a pre-contract meeting with the procurement team. Negotiations were conducted on aspects of the project to find out exactly what has been offered, and for what price. Other aspects included the evaluation of SC's ability to meet timescales, work programme, lead times and current workload.

After negotiations, a price was agreed and terms and conditions were finalised. A work order was placed with the SC. The SC was invited back for a pre-let meeting to go through a Subcontract Management Plan and Domestic Subcontract Order. The meeting was attended by the members of the site management and procurement teams. This meeting was also used to create clear understanding of agreed terms. The key documents used at this stage were: Works Enabling Agreement, Subcontract Pursuant to Main Contract, Drawings, Specifications, Schedule of Rates, SC Management Plan, Project Management Plan and schedules, Standard Risk Control Arrangements and SC Payment Timetable.

Soon after the order was placed the SC ordered materials to suit the MC's programme. Then the SC received design and architect drawings and started to work on construction drawings. The construction work commenced on site without any issues.

Construction Stage

Once the workforce arrived on site they received a full site induction and were asked to check and sign their method statements and risk assessments, a requirement of the MC. The SC passed drawings and specifications communicating only work related information to the workforce, who did not pay full attention to the method statements or risk assessments.

During the course of construction the SC raised a number of variations, on inspection of the architect's drawings in further detail. The issue was resolved through negotiations, and it was agreed to price on a lump sum basis which ultimately reduced the risk for the MC. Despite the SC recognising potential variations during procurement, the SC did not raise or discuss the variations at the procurement stage as this would increase their tender price.

It was discovered that the design of the Canopy, a key element, included an outline design; details were not available as the designer wasn't knowledgeable on this particular issue. To ensure continuity in the project, the MC had to take a proactive role to co-ordinate with the design team; produce design drawings spending time and money to resolve the issue as soon as possible. The MC decided to bear the costs of correcting and developing the design to enable the contracts to continue as the issue didn't come under the Works Enabling Agreement. The SCs programme was delayed through issues aligning the steel, preventing work being carried on the cladding rails. Another delay was caused

from late window installation, despite the issued being raised much earlier. However, the MC’s site management communicated to the SC constantly and played a proactive role to resolve the issues. This allowed the SC to re-direct their workforce to maintain workflow, avoiding confusion and maintaining a good relationship. Despite the problems, the completion of the SC’s package was achieved through close co-ordination and management.

Semi-structured Interviews

Semi-structured interviews were conducted with three key personnel from the MC namely Senior Site Manager, Quantity Surveyor and Senior Procurement Surveyor. Six SCs personnel namely Contracts Manager, Quantity Surveyor and four Managing Directors involved in SSTC project. The MC’s Project Manager had 9 years experience with the current company; Quantity Surveyor had more than 5 years experience dealing with day to day running of SCs. The Senior Procurement surveyor was working with the company for more than 2 years. All the SCs interviewed hold management positions and have worked with the MCs frequently, experience ranged from 8-20 years.

The objective of interviewing both people from the MC and SCs in the case study project was to obtain views from both sides so that an unbiased conclusion can be drawn and justify the findings of the SC presented earlier are representative.

Analysis of Interviews

Appendix 1 provides a list of questions used in the semi-structured interviews. The interviews were transcribed and were analysed using a template approach with a list of analysis variables and findings are presented in Table 2 with a comparison of variables identified through literature presented in Table 1.

Table 2. Analysis of Interviews

Interface Variables (Table 1)	Interview Analysis Variables	Findings from Interviews
<i>Communication</i>	Information supplied during procurement stage	MC highlighted that, drawings, specifications, subcontract management plan including H&S plan; all the site records (soil reports where applicable), company’s standard documents and background documentation. Normally bill of quantities (BOQ) are provided for re-measurable contract and SCs price up. However, one SC stated that “On this project, it was just drawings and there was no BOQ, we would have made our own bill up and specification, drawings were not that detailed”.
	Detail of information	MC sent information normally in electronic form; SCs had to troll through all information as MC covered themselves (sent all information, don’t miss anything). One SC stated “because there could be a drawing, we have missed because we don’t think it’s relevant, it gets missed and we price, so we then put drawing numbers to what we have price to”. Sometimes any missed information can be claimed from the client, sometimes it’s a loss to MC or SC it has been included in specification. The MC clarified that all information is sent mainly for lump sum packages.

	Communication during construction stage	In the beginning of the project when there are fewer SCs on site, communication is good. As the project progresses, more trades on site, the information provided will reduce. Updated drawings, specifications and programme are usually communicated.
<i>Unfair Practices</i>	Lead in times (Also see Negotiation)	SCs do not get sufficient time to provide a decent tender, and are always under pressure as many inquiries keep coming.
<i>Relationships</i>	Subcontract Process	The interviewee confirmed that subcontract process used in the projects mainly followed a standard process. The MC sent inquiry to 3-4 or 6-8 SCs depending on trade and complexity. The MC used supply chain database or found SCs from other sources that were suitable; negotiation was carried out once SCs submitted the price.
<i>Trust and Adversarial Relationships</i>	Trust	Lack of trust is an issue. SCs normally miss items that require the MC to interrogate quotations, negotiation becomes essential. "...it's human nature, if you have a personal relationship with somebody, you need to talk to them and communicate with them in a respectful way, 9/10 you will get respect back from them, instead of leaving arguments to the last minute, you can sit down with them iron them out, ...nothing is worse than something going wrong and the SC not telling you what's happened. We don't know what's going on, trying to argue over money, whose fault it is, it's so much easier to be on respectful talking terms in the first place". One of the interviewees' stated that "an honest SC is a good contractor."
<i>Planning</i>	Early involvement and Pre-contract planning	Both MC and SCs highlighted the importance of pre-contract meeting to understand the project, develop management strategy. SCs emphasised that knowing MC requirements and practices was essential to identify the right team for the job. SCs were involved from the beginning of the procurement process; 4 out of 6 of the more complex packages attended a pre-contract meeting to discuss various aspects of the project with the procurement team. Some went straight to pre-let meetings to discuss aspects of the project with the site management team after the procurement team had been in contact.
<i>Project Management and complexity of projects</i>	Coordination	One of the interviewees' highlighted: "It's quite a tight bit of coordination so, it's getting all parties in as well to make sure they all clearly understand where their responsibilities lie, make sure there all communicating together to also understand each other's part of the contract. So depending on how complicated the package is, they might have them in once a week or once a fortnight, making the progress meetings, making sure everyone is happy, everyone understands the programme, everyone knows where they should be working and the process their work involves".

<i>Price</i>	Negotiation	Normally negotiation is on price. All the SCs agreed that this impacts relationships. On SC in his own words suggested “relationships can be focused on a take it or leave it attitude...can’t see the point, of partnerships or supply chains” However, if it is in the form of value engineering, then it is seen as positive. Also, as one SC highlighted, in certain projects, where pricing is too high, which means the SC can’t really do much on it, MC’s flexibility and willingness to talk is appreciated by the SCs and negotiation in this case was seen as fair. MC argued that negotiation with SCs was seen as essential in order to find out what they are offering, clear up any misunderstanding between what you think their quote says and what they think they are offering, what they have actually included and more importantly what they have excluded and can do the work within the timescale.
<i>Quality</i>	Continuity of people in tender stage to construction	SCs normally involve management team leaders/foreman who are involved during the tender to construction but often have limited involvement during construction, site visits etc. Owing to the limited availability of senior managers. MC also viewed that it is important to have continuity of the people from procurement to construction. Normally a handover process is used to the site team to brief about the process.
	Reasons for failure	Some SCs who did not complete the work on time or within the budget highlighted the reasons as: quality of the materials supplied by the supplier; design discrepancies; problems with prefabrication in terms of design and accuracy and short lead in time.
<i>Dependence</i>	Strategies to progress with project	SCs do not provide strategies because they are reliant on the organisational management of the MC.

Key factors to improve relationships and success on projects

The SCs highlighted right prices during procurement; good management and co-ordination by the site team; frequent (weekly meeting) with other SCs where trades are dependent and managing variations mutually as key points for success. One of the MC interviewee emphasised that regular meetings with SCs should take place to monitor and provide feedback on their performance and suggest areas of improvement for successful outcome.

SCs highlighted the factors to improve, in their words, as: getting supply chain to get stuff on site and liaising with SCs to do the work; Continuity is the most important thing to us on a job, so you don’t have stop starting all the time’; more lead in times; regular site meetings; spend time to get design correct before issuing to the site. MC highlighted areas of improvement, in their words, as: improve communication; do not just depend on electronic communication but face-to-face too; and know your SC, have face to face meetings with them before the contract is let.

Questionnaire Survey

An online questionnaire survey using KwikSurveys © with 15 questions was sent to 98 SCs and 18 responses were received. The objective of the survey was to validate the

factors highlighted by the case study and interviews. The majority of SCs who responded to the questionnaire survey are involved in the superstructure work of construction. Only few relevant questions and responses are included in this paper.

Q: What type of procurement strategy is used mainly by the MCs?

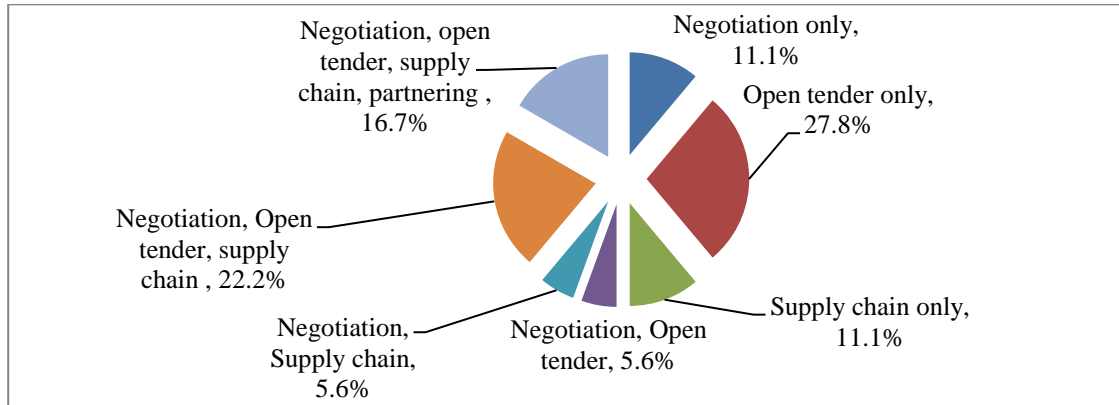


Figure 2: Procurement Strategy by MCs

The SCs were involved in mixed methods of procurement (with some were involved in single). Negotiation was common to many SCs and partnering was used the least. About 47% of SCs have been involved in supply chain and some used partnering, which highlights the project delivery is moving towards relationship oriented contracts.

Q: Have you ever been restricted by the following towards a tender?

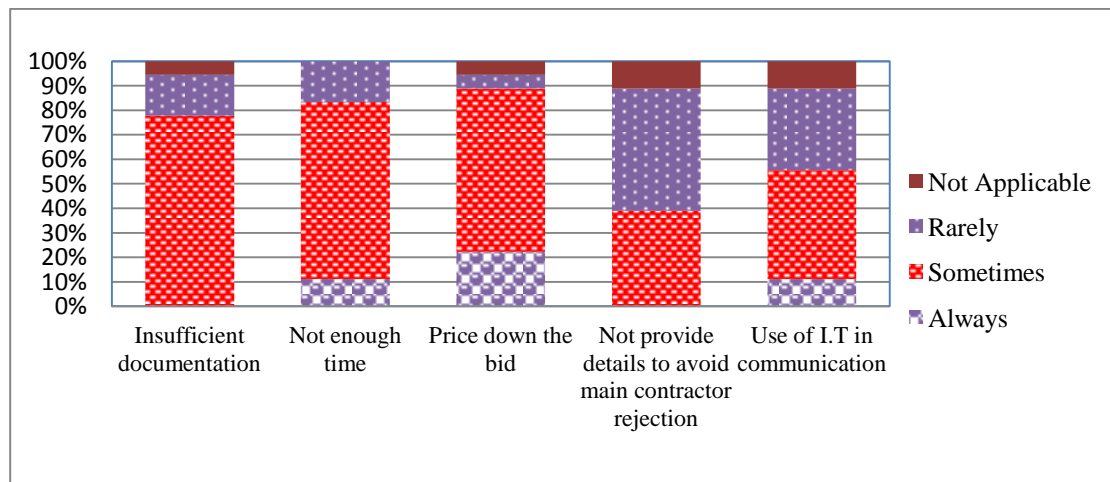


Figure 3. Tender restrictions

The combined responses for “always and sometimes” revealed that all of the SCs felt that they were restricted to provide compliant tender to the MC for different reasons. “Insufficient documentation” and “not enough time” back up the literature review finding that the documentation and time provided hinders the compliant tender by the SCs. Although it is not always in the MCs control, the issue tends to be passed down to the SCs. Interestingly, the responses “always” 22% and “sometimes” 67% for “price down the bid” indicates lack of trust and honesty in pricing and a strategy used by SCs to win the work. Responses for “not provide details to avoid MC rejection”, suggest the SCs, in general,

will tend to raise issues without fear for rejection. Too much information and the effort required to go through the electronic documents is also seen as a problem to some SCs.

Q: What are the implications of your early involvement in the procurement on project delivery?

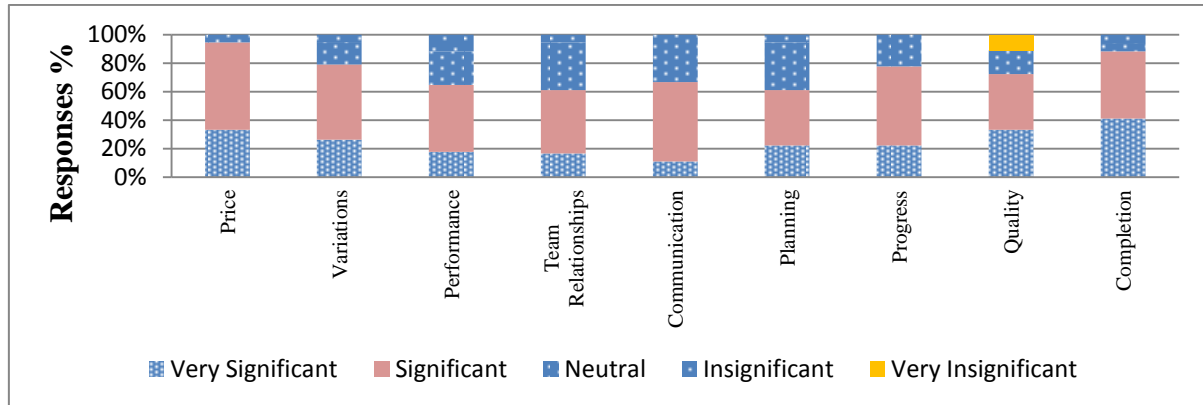


Figure 4. Implications of SC Involvement

Figure 4 shows that price and completion are influenced by the early involvement of the SCs and time given to complete the tender. Some SCs (11%) suggested the influence is very insignificant in terms of quality of work.

Conclusions

The level of involvement SCs with MC has a significant effect on their working relationships. Good relationships established during the procurement of the SC will create a better working relationship throughout the rest of the project. This was evidenced through the Case Study and Semi-structured interview findings. Lack of trust still prevails in the industry; fear of losing the work or desperateness to win the work from the MC, SCs are not opting for openness and honesty at all times. SCs are found to be more reliant on MC's strategic management and organisation of projects. Majority of SCs, in the questionnaire survey, felt that they were restricted to provide compliant tender to the MC for different reasons such as lack of detailed documentation, inadequate time or the need to price down the bid to win the contract. Early involvement of the SCs and adequate time given to them to tender was regarded crucial, which will not only provide right price first time but also contribute to the positive outcome of the project. The case study highlighted that good site management and proactive coordination by MC is a key to solve project issues and complete the project on time. The MC, in this study, regarded face-to-face communication (not just depending on electronic communication) to know SC before the subcontract is let as a crucial factor for successful outcome. The SCs interviewed in this study suggested that good management and coordination by the MC's site team; frequent (weekly meeting) with other SCs where trades are dependent in the progress and continuity of work and managing variations mutually as key points for success.

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Appendix 1: Semi-structured Interview questions

1. How many years have you been in your current position, are you frequently involved with Subcontractors and what is your specialisation?
2. Can you explain how you were involved, during the procurement process? (Selection, appointment, what stage of the project)
3. During the tender process, what information was communicated to provide a tender price?
4. Was there any change in documents provided during the tender up to the construction stage from the Main Contractor?
5. During the tender process were you involved in any negotiations, if was conducted? (Please explain who was involved and the topic of negotiation)
6. Once the contract terms are agreed, how did you proceed in developing strategies to progress with the project? (For example, selection methods, communication of documents)
7. How did you identify roles and responsibilities of your team to deliver the scope of the project?
8. What documents/information was communicated to the team to progress with the project?
9. Did you have the people involved in tender stage, involved during the construction stage?
10. Did you complete the project on time, according to schedule and within the budget, what are the reasons?
11. Were there any areas that could have been improved by the Main Contractor to enable you to progress more smoothly?
12. How do you decide procurement strategy for Subcontractors?(Main Contractor only)
13. What are the important factors to a Main Contractor/Subcontractor relationship?