

# **The Potential of New Models of Construction Procurement to counter cost overruns in construction projects: An exploratory study from a Contractors' Perspective**

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## **Abstract**

### **Purpose**

Cost overrun is a significant issue in construction, an undesirable feature the industry has long been affiliated with. Poor procurement practices are often blamed for subsequent cost overruns in construction, especially with conventional procurement methods leading to outrageous cost overruns. The purpose of this study is to review the features of the New Models of Construction Procurement (NMCP) and assess their potential to reduce cost overruns in construction projects.

### **Design/methodology/approach**

A literature review was conducted to identify the issues of procurement leading to cost escalations. Primary data were obtained through exploratory semi-structured interviews using a case study approach.

### **Findings**

Clients' lack of knowledge was highlighted as a key issue in procurement that interlinks with many factors causing cost escalation. The findings suggest that the features contained within the NMCP such as early contractor involvement and collaboration

throughout the project team have the potential to make a positive contribution to addressing cost escalation in construction.

#### **Research limitations/implication**

The primary research was undertaken as an exploratory study and presents the contractor's perspective. Further research is therefore suggested, with multiple organisations representing all key stakeholders in a construction project, including clients, consultants, sub-contractors, and suppliers.

#### **Practical implications**

The study recommends awareness of the NMCP be raised throughout the industry, and simplified information must be made available to help wider uptake of these contemporary procurement methods.

#### **Originality/value**

Addressing the dearth of research concerning the use of NMCP within the industry, this study makes a niche contribution to the body of knowledge on construction cost management by illustrating the potential offered by these new procurement methods in addressing cost escalation. For an industry where collaboration is accepted with reservations, this case study demonstrates how novel collaborative strategies such as open book costing, project bank accounts and shared pain and gain mechanisms can be implemented as part of the procurement strategy and how such strategies can contribute towards minimising the cost escalation inherent construction projects. **Keywords:** Construction Cost Escalation; Cost overrun; Cost-Led Procurement; Two Stage Open Book Model; Integrated Project Insurance; Collaboration; Procurement

## 1. Introduction

Construction cost escalation has become a crucial issue in the construction industry regardless of the size of construction projects (Eke et al. 2019, Hwang et al. 2020). Within the domain of cost overrun research, technical, risk, and uncertainty-related issues have been identified as the primary front-end factors that account for cost overruns (Rahmani 2020; Amadi 2021). Chen and Liu (2019) and Hwang et al. (2020) have identified different types of risks that led to cost overruns in the construction industry such as delays in the construction period (Ghauri et al. 2020), changes in construction (Lou et al. 2020), misunderstanding of drawings (Rahmani 2020), poor communication and coordination (Smith 2016). Irrational or lack of construction planning (Larsen et al. 2016; Hwang et al. 2020) causes unsystematic site management (Connaughton and Collinge 2021), such as unbalanced allocation of labour (Amadi 2021) leading to cost overruns. Most of these causes are related to the procurement process in construction projects and could be better managed with better procurement practices. For instance, Early Contractor Involvement (ECI), thereby procurement methods that incorporate ECI, could help minimise delays to project completion, subsequent changes to the design etc by capitalising on contractor input to the design and schedule of a project – and therefore reduce the risk of cost overruns later in a project. When closely examined, many of the causes of cost escalation could be avoided at the pre-contract stage (Tennakoon et al. 2021) and would be manageable if an appropriate procurement strategy is used. Similarly, poor and inconsistent procurement practices are often blamed for waste and inefficiencies in construction projects (Cabinet Office, 2011). Thus the need for better and improved procurement practices that can achieve cost efficiencies and reduce waste was recognised as a priority by the UK government

(Cabinet Office, 2011).

The UK Government Construction Strategy in 2011 envisaged achieving savings of up to 20% by making efficiencies through reforming procurement practices and effecting behavioural and cultural change (Cabinet Office, 2014). As part of this agenda, the government with the help of the industry introduced 3 new procurement models, namely; Cost-Led Procurement (CLP), the Two-Stage Open Book (TSOB) Model, and Integrated Project Insurance (IPI) (Cabinet Office, 2014). It was claimed that savings of approximately £3 billion were achieved between the years 2011 and 2015, to which the NMCP had inevitably contributed (Cabinet Office 2016). The subsequent Government Construction Strategy in 2016 (from 2016 to 2020) highlighted the government's commitment to these new procurement models and identified how their applicability will be further investigated to develop the evidence base for their adoption (Cabinet Office, 2016). The three new models include the principles of early supplier engagement, transparency of cost, and collaborative working to deliver a value-for-money outcome (Cabinet Office, 2016). The key features embedded within these new procurement models, especially early supplier engagement (incorporating Early Contractor Involvement (ECI), but going beyond that to engage major suppliers/subcontractors from an early stage), open-book working and cost-transparency, and collaborative working offer the potential to counter some of the age-old problems in construction procurement and minimise cost overruns. The construction industry, however, has been reluctant to keep up with the adoption of NMCP despite the recorded cost-savings and other potential advantages (Connaughton and Collinge 2021). This is within a context in which the government has committed to drive procurement efficiency and explore options for further efficiency gains in the procurement process as part of the

Construction 2025 strategy (HM Government, 2013) and as part of the Construction Sector Deal in 2018 (HM Government, 2018) which made several commitments concerning procurement including the promotion of long-term, collaborative relationships with industry to reduce transaction costs in procurement and maximise innovation – which are central features of the NMCP. The Construction Sector Deal (HM Government 2018) specifically mentioned the creation of model forms of procurement to help create sustainable business models for the construction industry. These commitments highlight the increased need for the modernisation of procurement practices in construction to achieve further cost efficiencies. Minimising cost overruns and delivering projects on a budget could help realise these commitments and the construction industry deliver better value to its clients. The research that led to the formation of this paper sought to assess the potential of the three NMCP to minimise cost overruns in construction projects.

## **2. Literature Review**

### **2.1 The link between construction procurement and construction cost**

Procurement is the procedure of fulfilment of the goods and services of a project or organisation for its successful operation (Perera et al. 2020). One of the widely accepted definitions of a procurement system was proposed by Masterman (2002), who identified the organisational structure adopted by the client for the implementation, and operation of a project, as a procurement system. Mathonsi and Thwala (2012) outlined procurement as the logical actions that occurred or were performed for the completion of a project. The method of procurement should align with the objectives of the client's

business plan, which is likely to include considerations such as cost, quality, risk, and financing (Yahaya et al. 2020). Procurement policies may have a major positive or negative influence on the development of the construction industry (Pekuri et al. 2014).

Previous research has highlighted the significant link between construction procurement methods and escalated construction costs. A survey carried out by the Chartered Institute of Building (CIOB) found that 99% of respondents had been involved in projects which had exceeded the budget, and 57% of respondents attributed it to the procurement method (CIOB 2012), highlighting the link between cost overruns and procurement practices. The Institution of Civil Engineers (ICE, 2020) identified procurement reform as a key intervention to reduce the gap between cost estimates and outturns (i.e. cost overruns) in major infrastructure projects. Rajeh (2014) introduced a structural equation model to identify the impact of the procurement system on transaction costs. Yahaya et al. (2020) identified the magnitude of transaction costs in construction procurement projects strengthening the assumption that there is a significant link between transaction costs and public sector procurement.

Numerous studies have highlighted the key issues in procurement that may lead to escalated construction costs (Doloi 2012; Cheng 2014; Rajeh 2014). Lack of communication, alterations to clients' requirements, issues over responsibility, design faults, design team problems, and supply chain issues are the most significant factors in procurement which may lead to escalated construction procurement costs (CIOB 2012). However, the CIOB (2012) report does not detail exactly how the attributes mentioned above may lead to high construction costs.

The GCS 2011 highlighted the client's lack of knowledge as a key issue in construction procurement (Cabinet Office 2016). Proverbs et al. (2000) identified design faults and alterations to the client's requirements as major issues in construction procurement, which seem to have continued during the next decade, as confirmed by the CIOB (2012). Pekuri (2014) highlighted uncertainty related to design as the main problem faced in construction procurement. However, it failed to link the design detail uncertainty to escalated construction costs.

Overall, there seems to be some ambiguity relating to the key issues in procurement which may lead to escalated construction costs. Therefore, in the present study, primary data were collected to assess the link between the key issues in procurement and construction cost escalations. Since the NMCP were introduced to reduce these issues, this research seeks to explore how the features of the NMCP address the issues leading to cost escalation in construction projects.

## **2.2 The New Models of Construction Procurement (NMCP)**

The 3 new models of construction procurement introduced by the Government Construction Strategy 2011 are briefly discussed below.

### ***Cost Led Procurement (CLP) Model***

CLP is a two-stage process that aims to allow the industry to use its previous experience to enable innovative solutions to be developed through leveraging design, materials, and subcontracting (Udom 2012). The client is required to clearly define their desired outcomes and requirements and to gain an understanding of costs before involving contractors, consultants, and suppliers through forming a strategic brief (Rahmani

2020).

Once the strategic brief has been established, during the first stage, multiple supply chain teams are selected from a framework on their ability to demonstrate integration and to deliver the project below the desired cost ceiling (Rahmani 2020). For the second stage, two to three framework teams will then be given the chance to develop their bids with the client's team (Cabinet Office 2016), and the successful project team can claim back the pre-contract costs within the construction contract (Cabinet Office 2016). Early supply chain involvement allows teams to utilise their previous experience to reduce costs and drive innovation within the early stages of the project (Cabinet Office 2016). In circumstances where several supply teams can better the cost ceiling, a supply team will be selected upon the attractiveness of their commercial and physical proposal (Cabinet Office 2016). If the target cost ceiling cannot be matched, the project will be offered to teams outside the framework (Udom 2012). The project will not commence if the target cost is unable to be met. Therefore, it is critical that the cost ceiling is achievable (Udom 2012).

Once a team has been appointed, a workshop should be held by an experienced facilitator whereby employees from both the client's team and the project team shall attend (Cabinet Office 2014a). At the workshop, the principles of the contract will be discussed, in addition to other factors such as Key Performance Indicators (KPIs), Building Information Modelling (BIM), execution plan, and a dispute resolution procedure (Cabinet Office 2014b).

### ***Two-Stage Open Book (TSOB) Model***

TSOB is similar to two-stage tendering as prospective project teams are invited to bid



for a project against a benchmark cost and an outline bid (Cabinet Office 2014b). Within the first of the two stages, the consultant and the Tier 1 contractor are elected upon their overheads, profit, design, and fee proposal per the project brief and budget (Cabinet Office 2014a). From the multiple teams, a single project team is selected to commence in the second of the two-stage process. The firm selected will then have the opportunity to collaboratively configure a proposal on an open-book basis, compliant with the client's desired requirements and benchmark cost (Cabinet Office 2014a). The team is then 'unconditionally appointed with an agreed price and clear risk profile is approved by the client' (Cabinet Office 2014a).

Unlike in two-stage tendering, within the second stage of the process, the integrated team, inclusive of the consultant and Tier 1, 2, and 3 contractors, develop the design, maximise value and acquire cost savings as an integrated team (Designing Buildings 2017) as opposed to the contractor singularly completing this process in two-stage tendering.

### ***Integrated Project Insurance (IPI) Model***

IPI is a unique insurance policy that insures the Integrated Project Team (IPT), which includes the client and alliance partners to the contract (Designing Buildings 2017). Initially, only one insurance provider had enrolled on the IPI insurance scheme, which is Griffiths & Armour (Cabinet Office 2014b). Alliance partners include the consultants, the contractor, and the Tier 2 and 3 suppliers who report to the Alliance Board, which will ideally create a collaborative virtual company as an IPT as opposed to representing their firms as in traditional procurement methods (Udom 2012). A member of staff from each organisation participating in the project will be appointed to take a seat on the Alliance

Board and practitioners understand how to collaborate through the progressive enactment of working together rather than by developing a prior agreement about what collaboration would involve (Connaughton and Collinge 2021). An Alliance Manager will then be selected to manage the board (Udom 2012). Alliance partners are selected on their capability of reducing waste through removing inefficiencies (Cabinet Office 2014b).

At the start of the project, an Independent Facilitator (IF), a Technical Independent Risk Assurance (TIRA), and a Financial Independent Risk Assurer (FIRA) will be appointed as the advisory team (Designing Buildings 2017). The advisory team is responsible for assisting the client in creating the initial target cost, strategic brief, success criteria, and procurement documentation, and supporting the client in selecting the alliance partners (Udom 2014). Alliance partners are chosen on their ability to achieve the strategic brief and success criteria along with their solutions for removing inefficiencies below the target cost (Cabinet Office 2014b). The Alliance Team is responsible for driving the initial cost down. If the IPT/Alliance Team manages to obtain a target cost below the initial cost founded by the advisory team and the client, then gains are shared between the Alliance Team (Cabinet Office 2014b). On the other hand, if the cost increases above the initial cost, then the increased cost is shared between the parties. Once an IPT has been selected, a project bank account is set up by the client (Designing Buildings 2017). Once the IPI has been initiated, the roles of the TIRA and FIRA will also be novated to the insurer (Cabinet Office 2014b).

### ***Key features of the NMCP***

When individually reviewing CLP, TSOB, and IPI procurement methods, it could be

observed that each model shares several similar characteristics. Table 1 illustrates the similar characteristics of the NMCP. These characteristics enable achieving the key objectives of introducing the NMCP to the UK construction industry.

**Table 1: Key features of the NMCP (Source: Adapted from Cabinet Office, 2014b)**

<b>Objectives</b>	<b>CLP</b>	<b>TSOB</b>	<b>IPI</b>
<b>Early supply chain involvement</b>	Contractors' involvement with the project team starts within the second stage of the two-stage process	Contractors' involvement with the project team starts within the second stage of the two-stage process	Contractors' involvement with the project team starts within the second stage of the two-stage process
<b>Maintenance of competition</b>	2-3 subcontractors submit bids within the second stage of the two-stage process	Several contractors, Tier 2 and 3 suppliers and consultants bid in the first of the two stages	Several contractors, Tier 2 and 3 suppliers and consultants bid in the first of the two stages
<b>Collaborative working</b>	A collaborative working protocol will be distinguished between the whole project team and techniques of how components will be achieved will be established	A collaborative culture is adopted throughout the project team	Special measures will be reinforced to ensure that Tier 1, 2 and 3 suppliers are fully committed to the collaborative principles which will be overseen by the IF
<b>Project bank account</b>	An optional feature	An optional feature	A compulsory feature
<b>Use of BIM</b>	BIM is an optional feature of the model which is implemented through a BIM Execution Plan	BIM is an optional feature of the model which is implemented through a BIM Execution Plan	BIM Level 3 is a compulsory factor of the model
<b>No blame culture</b>	A dispute resolution procedure will be predetermined during the early stages of the project	N/A	Reinforced through a shared pain/gain mechanism within the contract
<b>Open book costs</b>	All costs are on an open-book basis so that	All costs are on an open-book basis	All costs are on an open-book basis

Objectives	CLP	TSOB	IPI
	suppliers can be audited		
<b>Risk management</b>	The main risks are identified during the early stages of the project through ECI and are mitigated by the contract. A joint risk pot is also an optional feature	The main risks are identified during ECI and are mitigated by the contract. A joint risk pot is also an optional feature	A no-blame culture is adopted, which predetermines and caps risks
<b>Shared pain/gain mechanism</b>	An optional feature of the model	An optional feature of the model	Reinforced through a shared pain/gain mechanism within the contract

According to Table 1, Early Contractor Involvement (ECI), collaborative working, and open book costs are compulsory features of all three NMCP. Competition is maintained within the NMCP through several contractors bidding for the first stage of the two-stage tendering process. Within both TSOB and IPI, from the first stage of the two-stage process, one successful project team is selected to work with the client's team to develop a bid. However, within CLP, several project teams are selected to work with the client's team during the second stage, and one successful project team is then selected at the end of the second stage of the two-stage process.

Furthermore, collaboration is promoted within all three NMCP through different mechanisms. As seen in Table 1, a collaborative protocol is established throughout the project team from the start in CLP. However, an IF will oversee the project team in IPI to ensure that collaboration is maintained throughout the project team. On the other hand, TSOB relies upon a collaborative culture adopted by the project team to reflect integration among team members.

In addition to this, a project bank account and the use of BIM are mandatory features of the IPI model but are optional features in both TSOB and CLP. There is a lack of available evidence relating to how a no-blame culture is reinforced through the TSOB model. However, within IPI, a no-blame culture is enforced through a shared pain/gain mechanism, but there is a lack of available evidence to demonstrate how gains and losses are distributed among parties. A shared gain/pain mechanism is a mandatory feature of the IPI model but is an optional feature in both CLP and TSOB. Concerning risk management, the IPI model's no-blame culture predetermines and caps risks. However, both within CLP and TSOB, risks are identified through ECI and are mitigated within the contract by forming a joint risk pot.

However, there is a lack of evidence of how CLP, TSOB, and IPI mitigate the key issues in procurement which may lead to cost escalation. Furthermore, as the NMCP only had limited application beyond the pilot studies, there is limited information available regarding contractors' perceptions of the new procurement routes. It was noted that the majority of information available regarding the NMCP is published by the Cabinet Office and lacks external scrutiny. Therefore, this research was conducted to identify the underlying issues in procurement leading to escalated costs and key features of new models of procurement to mitigate the identified issues. From the data collected, recommendations of how the NMCP can be improved are also reviewed.

### **3. Research method**

The study aimed to explore the potential of NMCP to mitigate construction cost escalations. Given the current dearth of knowledge on the topic of NMCP, the study was undertaken as an exploratory study. An exploratory, single case study approach was

employed for this study to achieve the set objectives. The exploratory case study functions as the preliminary investigative stage of a more rigorous study to follow (Wedawatta and Ingirige, 2016). Qualitative case studies have been a long existed, well-established approach because they allow a detailed analysis of a selected single unit of data source (Johnsson, 2013; Jaillon and Poon, 2008). It offers an effective way of creating knowledge by gaining comprehensive insights into a typical case that represents general characteristics (Yin, 2009). Sutrisna and Goulding (2019) characterise case studies to be descriptive where a certain phenomenon or a process is systematically identified and recorded to gain in-depth knowledge. Similarly, Yin (2018) rationalises single case study research because of the selection of a typical case, which creates knowledge from its representativeness. The construction organisation selected as the case study is a leading construction company in the UK, which maintains a positive attitude towards innovation in construction. It facilitates Design for Manufacture and Assembly (DfMA), digitalised construction, sustainable construction, and innovation. As an innovative approach to project procuring, the NMCP has been considered by the company in their latest projects. Exposure to the NMCP was a key criterion considered in selecting the company for the case study. Hence, the participants from the case study company are in a better position to comment on the potential of the NMCP to mitigate cost escalations.

Purposive sampling was used in the study with the expectation to select participants with diverse exposure and experience in various procurement methods including NMCP. Purposive sampling is 'used to select respondents that are most likely to yield appropriate and useful information' (Kelly, 2010). It is recognised as an effective way of identifying and selecting cases that will use limited research resources effectively

(Palinkas et al., 2015). Within the case study approach adopted, purposive sampling allowed the selection of suitable personnel within the company. Ten participants representing pre and post-construction stages were purposively shortlisted from the case study company.

Qualitative analysis was preferred to quantitative data in this research. Qualitative methods “seek to gain insights and understand people’s perceptions of the world” (Fellows and Liu 2015), which quantitative data cannot generate. Primary data is obtained by using semi-structured interviews. The interview questions were designed to suit the aim of the research. Data collection was undertaken until the data set became saturated with the interview questions; this saturation was achieved after the completion of six interviews. O’Reilly and Parker (2013) argued that the number of participants required in qualitative research depends on the nature of the topic and the resources available, as sampling in qualitative research primarily needs to take the richness of information into account. Sim et al (2018) argued that the decision on what constitutes an adequate sample size to meet a study’s objectives has to be made through a process of ongoing interpretation by the researcher, as opposed to a specific number decided a priori. Alternatively, Guest et al (2020), identified that 6–7 interviews will typically capture the majority of themes in a homogenous sample (6 interviews to reach 80% saturation). The sample was considered adequate reflecting on this being an exploratory study and considering the richness of information, new information emerging from each new additional interview and resources available. The interviewees were the commercial director, pre-construction director, supply chain manager, senior project surveyor, design manager and planner, representing different functions and roles within the organisation. Each participant was assigned a code (A, B, C, D, E, and F)

to keep their identity anonymous. The interviews were recorded and transcribed and sent to participants for verification. The thematic analysis is conducted after manually coding the data from the interviews.

#### **4. Data Analysis and Discussion**

The findings of the study outline the underlying issues experienced by the project participants in their projects managed using conventional procurement methods.

##### ***4.1 Underlying issues related to procurement leading to cost escalation***

The themes which were generated indicated that the participants attributed the key factors in procurement which led to escalated construction costs are as follows: lack of design information; lack of clarity; client's lack of knowledge; and macro-economic factors.

##### ***4.1.1 Inability of the procurement method to address the inconsistencies in project briefing***

Findings among primary and secondary data indicated that inaccuracy in design is one of the pivotal issues within construction procurement (El-Kholy 2019). As reasoned by Participant A, it means that assumptions must be made by the contractor or subcontractor, which incurs costs later when more design information is made available. Participant F also confirmed this, stating, "A client being unaware of the design information required to provide a satisfactory quotation at tender stage". Moreover, Participant B highlighted that design contingency is required by adding in costs for risk to bring the project to a buildable stage. Furthermore, as Participant B stated, "the longer the design is not finalised the more impact whilst on site as subcontractors are waiting for design information to be complete before placing orders/works commencing



on-site". Smith (2016) has also mentioned that the transaction costs during procurement may significantly increase when the designs are incomplete and unconfirmed. Overall, the participants agreed with the well-known fact that a lack of design information causes an escalation in construction costs.

#### ***4.1.2 Poor definition of the roles and responsibilities of the project participants in the procurement model***

The lack of clarity in the procurement process emerged as a theme that may lead to escalating construction costs (Heravi and Mohammadian 2021). Participant A stated that lack of clarity in terms of the responsibility of the project participants, communication lines, and design information all result in difficulties in meeting budgetary constraints. For example, Participant E highlighted that lack of clarity in the client's brief caused the project team to perform alterations which could result in additional costs. Participant F stated: "There is also a lack of clarity from the client of who is responsible for what, which also incurs costs later down the line. Overall, all the issues reviewed link back to the client's lack of knowledge". However, when participants were asked their opinions about lack of communication being a key issue in procurement (Heravi and Mohammadian 2021), the issue of 'lack of clarity' naturally arose, which indicates the importance of the issue in procurement. Participants A and B also revealed that the lack of clarity among parties is a more significant issue than the lack of communication.

Literature supports participants' views because articles published by Rahmani (2020) and Lou, et al. (2020) both highlight the lack of clarity as an issue in construction procurement. Themes established among primary data links with secondary data where

lack of clarity, lack of design information, and issues over responsibility were the main reasons for construction cost escalations.

#### ***4.1.3 Lack of provisions to make the clients aware of the consequences of their decisions during the procurement process***

New findings that emerged from primary research indicated that the client's lack of knowledge is a crucial issue leading to construction cost escalations (Hwang et al. 2019). According to Participant C, changes to the requirements during the project by the client might seem simple from their perspective. However, this may incur additional costs. Participant D also confirmed this and gave an example: "...moving the location of a sink but it spirals the cost of the whole project as the mechanical and electrical system will require redesigning". Participant B also observed that lack of cooperation and the client's lack of knowledge are the main issues overall in procurement which leads to high project costs because the design information could be at the construction stage RIBA Stage 4. However, without the client's support in clarifying issues (Perera et al. 2020), such as responsibilities and confirmed requirements (Connaughton and Collinge 2021), costs will still be incurred during a later stage of the project. However, note that the views here are from those representing a construction contractor. If the perspective of either the clients or consultants was observed, a different picture could emerge.

Additionally, a previous study also highlighted clients' insufficient knowledge as a key factor in the success of a project (Pekuri et al. 2014). Yet, clients do not seem to understand the importance of clarifying responsibilities/alterations, and this results in gaps within design information. This makes project durations longer than anticipated because the design team is catching up by designing components of which they were originally unaware were their responsibility to design.

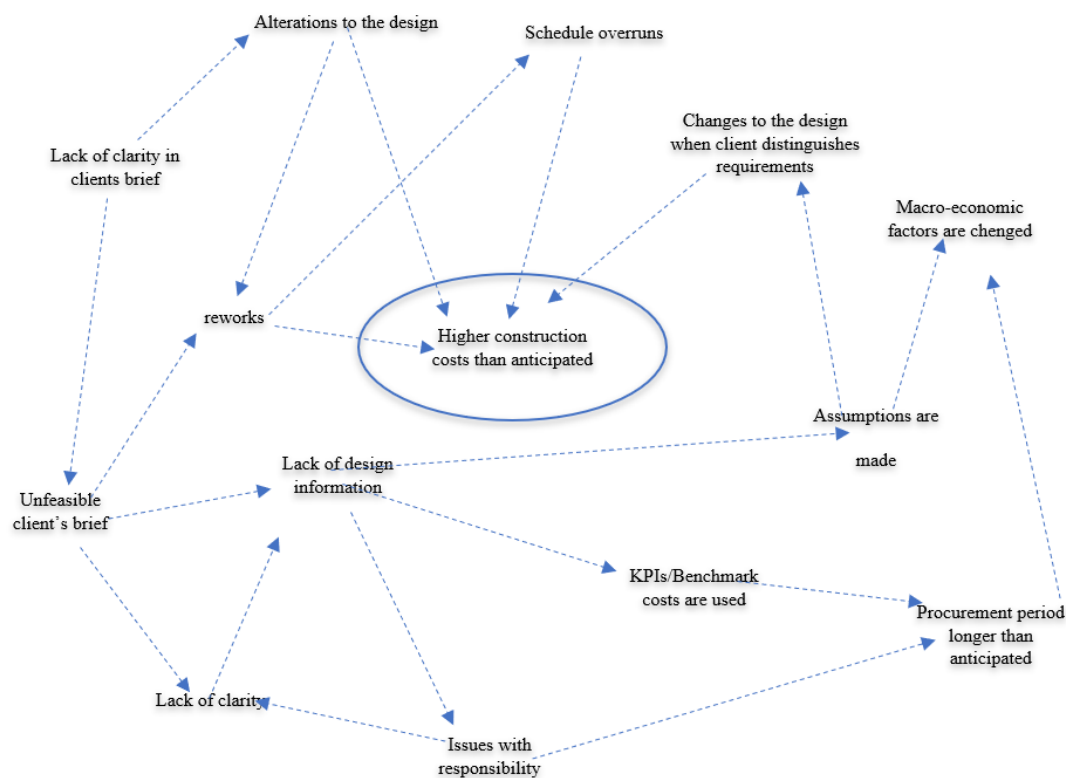
#### ***4.1.4 The lack of mechanisms within the procurement method to handle macroeconomic factors***

The participants overall view was that, due to long procurement periods, the cost of materials and labour increases from the initial cost submitted to the client to when the orders are placed. Participant D also linked the lack of design information to the macroeconomic situation, claiming “...if the design is inadequate to the price, the project quantity surveyor uses benchmark costs to fill the unknowns. As procurement periods take long durations, the costs of resources and materials increase, which makes the cost attained from the main contractor significantly higher than the initial cost”. Macroeconomic factors such as inflation, interest rates etc could have a different impact on construction projects than initially estimated. If the pre-contract duration can be minimised through the use of better and faster procurement processes, it will provide the opportunity to develop more realistic estimates and minimise the potential impact of changes in macroeconomic factors. Vigneault et al. (2020) also recognise macroeconomic factors as an issue that leads to increased costs, even in 5D BIM solutions.

In summary, lack of design information, lack of clarity, lack of client knowledge, and macroeconomic factors were the key reasons identified by the research participants as factors leading to construction cost escalations. These issues are observed starting from the procurement stage. By identifying how these issues are interlinked with construction procurement, construction cost escalations can be mitigated from an early stage.

#### 4.2 Interlinking problems in construction procurement

Figure 1 shows the themes derived from the participants' opinions about underlying issues in procurement that may lead to escalated construction costs. As shown in Figure 1, participants' overall perceptions were that the underlying issues in construction procurement are rooted in the client's lack of knowledge.



**Figure 1: Interlinking issues in procurement leading to escalated construction costs (Source: Authors own work)**

Overall, the participants asserted that a client's lack of knowledge would result in an unfeasible client brief being produced that might contain a lack of design information and clarity resulting from the client's poor delegation of responsibilities. Due to these responsibilities not having been correctly assigned, the procurement process usually has

a longer duration than originally anticipated because the design team/subcontractors must spend extra time designing components, which could have been done if clearer instructions had been given. Due to this longer procurement period, macroeconomic factors tend to affect the originally quoted price of labour/materials, leading to higher construction costs than anticipated.

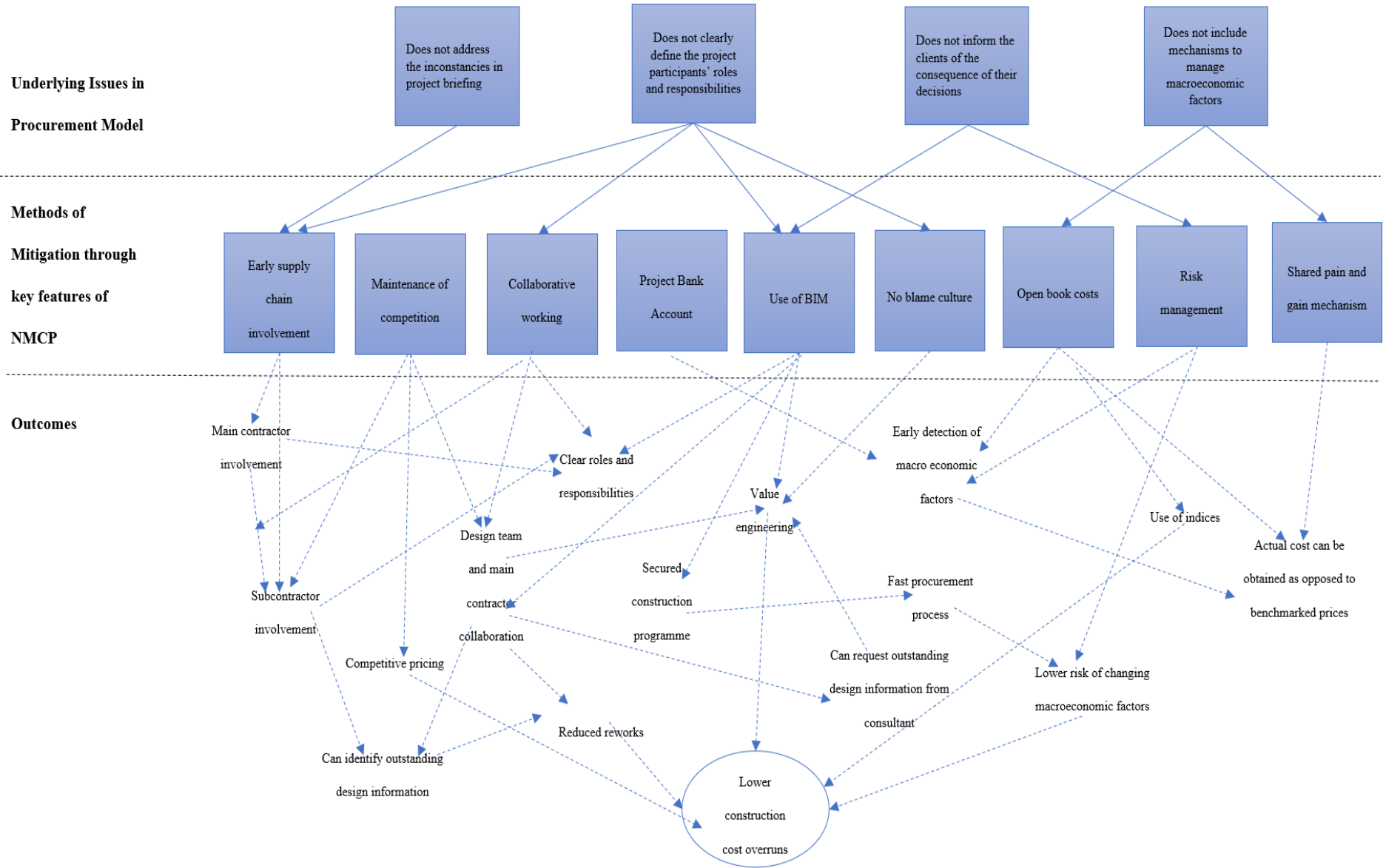
Interviewees perceived that a lack of design information also results in assumptions being made to fill gaps in the design through the use of benchmark costs and KPIs. Often, KPI and benchmark costs are affected by macroeconomic factors, which result in higher construction costs than anticipated (El-Kholy 2019). Lack of initial design information also results in assumptions being made which later require updating when the appropriate information becomes available. This can result in design development fees being charged by subcontractors, which also leads to higher construction costs than anticipated. The client's lack of knowledge also causes issues when alterations are proposed to the design because clients do not understand the extent of the variations required to accommodate the alteration. This tends to lead to higher costs than estimated.

#### ***4.3 The key features of the NMCP that mitigate the underlying issues highlighted***

As demonstrated in Figure 2, the general view among participants was that ECI allows for assumptions to be eliminated, and responsibilities among parties can be ideally resolved earlier. On the other hand, Participant B revealed that "ECI is only useful if the client's team is willing to work with the contractor to develop the design, and, if not, this will only result in a prolonged procurement period", and that "ECI does not guarantee a lower construction cost but a more realistic perception of the final cost statement". The

difference in opinions could be due to Participant B's exposure to the wider industry by working for a variety of employers and within a range of geological locations.

Further to the positive feedback among interviewees and secondary data concerning ECI, Participants E and F also acknowledged the benefit of appointing the contractor at the same time as appointing the client's design team. The similarities between participants' views could be due to their hierarchical positions which require frequent collaboration with the client's team. In Figure 2 below, a summary of participants' views on mitigating the underlying issues in procurement through collaboration and ECI has been given.



**Figure 2: Key features of NMCP that counter cost overruns in construction projects (Source: Authors own work)**

Among participants' opinions, ECI and collaborative working throughout the project team are interlinked factors. However, a limitation of the research was that the case study company is one of the few large contracting companies in the construction industry, and the remainder of the sector is made up of many Small and Medium-sized Enterprises (SMEs). Therefore, due to the case study company being a large multinational firm, it is likely to have a good understanding of the recurring issues in procurement that have been experienced by the firm and have been voiced within primary data obtained for this research project. Because of this, procedures may have already been enforced to mitigate the highlighted underlying issues in procurement. Therefore, the policies in place in the case study organisation may be different from those enforced in SMEs, and issues like ECI and collaboration may not be carried out as proficiently within the wider industry.

Open book costing is another key feature of the NMCP. Overall participants' perceptions were that open book costs allow for trust to be built between the client and contractor but do not necessarily allow for cost savings to be attained. The participants' views are also supported by literature, which details that the evolution of open-book costing was to improve trust between the government and the supplier (National Audit Office 2015).

Overall, participants asserted that parties are only likely to be honest with open book working if profit margins are being achieved. Participant A stated: "It depends on what the incentive is for the contractor to go completely open book. If the contractor is guaranteed repeat work, i.e. a framework contract, a contractor is more likely to be open book as there is a potential relationship that can be built between parties as opposed to a one-off job". This comment was similar to Participant C's. Nevertheless,



new findings, which Participant E revealed, were that “due to cultural blockers, the client believes that the contractor’s profit margins should be no higher than 2% to 3%. However, in other industries, profit margins are much higher. Because of low-profit margins, the contractors are unable to invest in research and development/training, etc.” The difference in opinions among participants about open-book costing could be due to Participant E being responsible for agreeing on profit margins with the clients and deciding where profits are invested within the firm, unlike Participant A.

Moreover, the NMCP seek to foster a ‘no blame culture’ to mitigate issues over responsibility. Issues over responsibility have been highlighted as a key issue in procurement within both primary and secondary research. Participants also closely linked the success of parties working as an IPT to collaboration. Participants believed that the success of a no-blame culture is dependent upon the integration/collaboration of a project team and a pain/gain culture being adopted. These views are also supported by secondary literature, such as the research carried out by Alhasan et al. (2017), which outlines that a no-blame culture is a culture of openness and willingness to share the pain and gain from experimentation; one that requires true collaboration.

A shared pain/gain culture is a mandatory feature of the IPI model and an optional feature of the TSOB and CLP models. Participant B’s views on a shared pain/gain culture are inclusive of “a no-blame culture heavily dependent upon whether the models are adopting a pain/gain mechanism. However, in theory, one party will always be more accountable for a mistake than another party, which raises the question of whether one subcontractor is willing to or has the resources to forfeit their profits for the mistakes of another subcontractor”. Similarly, Participant A highlighted: “the only

way a no-blame culture could be successful would be through a shared pain/gain mechanism and without this I can't see how a no-blame culture could work".

Participant C also highlighted a disadvantage that the pain/gain culture has upon SME subcontractors as "the losses incurred from a mechanical and electrical subcontractor may be too substantial for a curtain walling/steel frame contractor to bear, given that it is assumed losses/gains are distributed among the project team". Furthermore, participants also did not grasp how the concept of a pain/gain culture could be practical within the industry and mentioned the lack of available data regarding how savings/pain will be distributed among parties.

#### ***4.4 Potential of wider use of NMCP with further improvements***

Despite the NMCP containing mechanisms for ECI and collaboration throughout the project team, participants' perspectives of further mitigations are explored and presented as improvements to the NMCP.

##### ***4.4.1 The procurement process to define the level of detail expected in the design***

To mitigate further against the lack of design information being a key issue in procurement, participants suggested that the NMCP should include a mechanism that indicates that the design must reach a particular RIBA stage before the client sends the project out for tender. Participants B and E both took this point further and suggested that the design should be at least at RIBA Stage 3 (Developed Design) before the project goes out to tender. The RIBA Plan of Work referred to here is the 2013 version which has eight stages from 'Strategic Definition' to 'In Use'. However, Participant D highlighted that, unless design information is at RIBA Stage 4 (Technical Design), "a realistic price cannot be obtained". However, for RIBA Stages 3 and 4 to be achieved

before the tendering stage, the true benefits of ECI involvement as expected in the NMCP may not be achieved because the contractor and the supply chain team will only proceed with the project once the design has been substantially completed. Involvement of the interested contractor teams in the process much earlier during the first stage of the two-stage process in the NMCP and then agreeing on a price at a defined later RIBA stage as part of the two-stage process may be the way forward here.

#### **4.4.2 Use of indices, risk management and shared pain and gain to confront changes to macroeconomic factors**

Participants suggested that the incorporation of indices as a key feature of the models will mitigate against macroeconomic factors like fluctuations in materials and labour. The use of indices will allow for a realistic price to be obtained even if the procurement process is prolonged. Participants indicated that ECI allows for the contractor to agree on a fixed programme of works and labour costs. However, Participant D also highlighted that, due to market uncertainty, subcontractors may not be able to commit to a price until the order has been placed, and quoted fluctuations in the price of steel as an example of why fixed costs are not always attainable.

#### **4.4.3 Incorporation of Pre-construction Service Agreement**

Overall, participants believed that the incorporation of a Pre-Construction Services Agreement as a key feature of the NMCP will mitigate against the lack of clarity and design information in procurement. Participant D also suggested: “At the end of the first stage of the two-stage process a pre-contract services agreement is agreed upon. Therefore, at the end of the second stage of the two-stage process, if the client and contractor cannot agree on a cost then the contractor is not out of pocket”. By

incorporating this measure, both parties would have gained incentives without either party being disadvantaged if the contract has not been pursued, which also links to the contractor being able to recoup procurement fees (Heravi and Mohammadian 2021). Participant E also outlined the benefits of appointing the contractor at the same time as the consultant. As discussed above, suggested improvements to the NMCP include ensuring that design information is at a particular RIBA stage before tendering the project and incorporating indices and a Pre-Construction Services Agreement at the beginning of the second stage of the two-stage procurement process.

## **Conclusion**

Cost performance remains one of the key parameters of the success of a construction project. Whilst unexpected events may also have an impact, often, the occurrence of cost escalation is a consequence of the series of decisions taken from the project conceptualisation. Accordingly, the selection of an appropriate procurement path plays a pivotal role because the decision-making power risk and reward distribution of the project stakeholders depends on the procurement method. Despite the wider use, the conventional procurement models have failed to provide an abiding solution to construction cost escalation. Hence, this study sought to investigate the underlying issues in conventional procurement that may lead to construction cost escalation and to determine whether NMCP could help mitigate those issues. Accordingly, the underlying issues in procurement within the construction industry which lead to escalated construction costs are the client's lack of knowledge, lack of clarity, lack of design information, and macro-economic factors. All these factors seem to be interlinked but are predominantly rooted in the client's lack of knowledge. It must be

noted, however, that this is essentially the view of the contractor's personnel and other stakeholders may present a different perspective.

Overall themes derived from the empirical data indicate that collaboration throughout the project team and ECI seem to mitigate issues in procurement leading to escalated construction costs. Just as the underlying issues are interlinked, so are the mitigations. Overall, participants agreed that open book costs allow for trust to be built between parties, but this does not necessarily allow for cost savings to be attained. Furthermore, the success of a no-blame culture is dependent upon the adoption of a gain/pain share mechanism. The NMCP can be improved through the incorporation of indices and a Pre-Construction Services Agreement at the beginning of the second stage of the two-stage procurement process.

A key recommendation is for the NMCP to specify how the shared gain/pain mechanism will be distributed among supply chain partners. This is because participants raised concerns that the case study company may not pursue IPI due to the lack of available information regarding how gain/pain will be distributed among parties. Therefore, incorporating a template into the models of how gain/pain will be typically divided among parties is recommended because, currently, gain/pain has been assumed to be divided equally between organisations within the project team. Another recommendation is for awareness of the NMCP to be raised throughout the industry. The case study company is a large multinational construction firm. However, many people within the company were unaware of both CLP and IPI because, in general, participants believe that the new procurement routes have not been heavily publicised within the industry. Also, it is suggested that information published on behalf of the government through the Cabinet Office is simplified. Through simplification,

information will make the NMCP procedures easier to understand because current requirements are both technical and unclear.

The research provided an account of how the NMCP attempt to reduce cost escalation in construction projects, which is a necessity if the anticipated benefits of 20% cost reduction are to be achieved. Despite various initiatives to curb cost escalation in construction, the issue remains integral to the industry, and the findings suggest that the features contained within the NMCP have the potential to make a positive contribution to the issue. The study has attempted to identify the critical issues that lead to cost escalation in construction projects and assess whether the features included within the NMCP can help address these. Some of these features may be there in other procurement methods as well, but the features are essential components of the NMCP considered here and therefore are expected to be ever present in projects administered using these methods. Essentially, this is the key point of departure in the current study, compared to other studies on more traditional procurement methods and their role in cost escalation.

The primary research, however, was undertaken as an exploratory study and is limited to a single contracting company. While accounts provided by the participants from the company have enabled a good understanding of the issues being discussed specifically from a contractor's perspective, their views may be biased towards a large, multi-national contractor and may not represent those of the wider industry. Further research is therefore suggested, with multiple organisations representing all key stakeholders in a construction project, including clients, consultants, sub-contractors, and suppliers. The next stage of the study will further investigate the overall view of the

project teams including consultants and clients using a larger sample, using quantitative analysis.

Theoretically, the current study addresses the considerable gap in the research on the literal replication of the features of the Cost Led Procurement Model, two-stage Open Book Model, and Integrated Project Insurance Model regarding the ability to subdue cost escalations. Further research can be conducted on the applicability of the study findings using deductive, quantitative research. As for the practical implications, the study contributes to the evidence base on the NMCP and their potential to deliver the benefits expected of them, which will help the industry to decide on their uptake.

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