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Use of New Models of Construction Procurement to Enhance Collaboration in Construction Projects: The UK Construction Industry Perspective

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Abstract

Purpose: The lack of collaborative working within the UK construction industry is a long-standing issue that has often been highlighted. As a result, the construction industry in the UK is encouraged to use novel procurement methods to create a collaborative working environment. This study explores the collaborative features of the three new models of construction procurement introduced by the UK Government Construction Strategy in 2012.

Design/Methodology/Approach: Existing research/literature was reviewed to establish the key collaborative features of the new procurement models, and a questionnaire survey was adopted to obtain views of industry practitioners. A Relative Importance Index was used to analyse the collected data.

Findings: The sample of construction practitioners surveyed largely agrees with the effectiveness of collaborative features integrated within the models, with the benefits offered by early contractor involvement being seen as the most effective feature allowing collaboration. Contractual incentives, improved communication procedures and constant reflection and feedback can be used as effective strategies to enable greater collaboration in projects that use these new procurement models.

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Originality: This study sheds light on the scepticism and/or conviction of industry practitioners regarding the collaborative benefits offered by the new procurement models, which have not yet been subjected to significant academic scrutiny.

Research Limitations and Implications: Findings reported in the paper could help achieve greater collaboration in construction projects executed using the new models of construction procurement.

Keywords: New Models of Construction Procurement; Collaboration in Construction; Cost-Led Procurement; Two Stage Open Book Model; Integrated Project Insurance; Integrated Project Delivery

Introduction

Traditionally, construction projects have been conducted within a fragmented and adversarial environment, with delays and disputes being common (Norberg-Johnson, 2015). As such, the need to improve collaboration within construction is well documented. The KPMG Global Construction Survey of 2015 identified that 82% of construction professionals expect greater collaboration between clients and contractors (Reconomy, 2017), evidencing the desire for change.

Improved collaboration within construction is rife with benefits. Bresnen and Marshall (2000a) identify project cost and schedule reduction, alongside improved buildability and greater responsiveness to user requirements, as the main benefits of increased collaboration. As identified by Lang (2019), 91% of contractors and clients believe that increased collaboration reduces the overall risk involved in construction projects. Standard forms of contracts such as the suite of New Engineering Contract (NEC) and information technological solutions such as Building Information Modelling (BIM) are some instances where provisions have been made to capitalise on these benefits. The introduction of the New Models of Construction Procurement (NMCP) by the UK government in 2012 was carried out with a similar view (Ward, 2019).

In this study, the NMCP relate to three new procurement methods: Integrated Project Insurance (IPI), Two-Stage Open Book (TSOB) and Cost-Led Procurement (CLP); each of which features collaborative working at heart to deliver value for money. Although much has been made of the potential benefits of the NMCP through trial projects, very little research has been undertaken regarding the views of industry professionals,

specifically the concept of collaborative working within the NMCP, principally within an academic context (Ward, 2019). This lack of independent evidence may be a reason why these new models of procurement have not had the level of uptake expected when they were first introduced. According to the National Construction Contracts and Law Report (NBS, 2018), conventional procurement routes such as the traditional (separated) method and design & build procurement still dominate the UK construction industry, with other procurement methods being relatively niche. The NBS (2018) report does not feature the new procurement models specifically, despite them having been around for several years since their introduction, suggesting that their wider adoption is still in its infancy. Further investigation of the potential collaborative benefits offered by these models and the perspective of the industry practitioners will enable the models to be compared and contrasted with other procurement options available. For example, Eke, *et al.* (2019) noted that to persuade more industry professionals to adopt the best value concept in construction, more evidence must be shown on how it can affect a construction project. Further, Davis (2018) has highlighted the insufficiency of studies focusing on collaboration in the context of the procurement method used. Therefore, this study is focused on investigating the collaborative features of the NMCP based on the views of industry professionals. Identification of the key collaborative features and barriers to collaboration will help towards the agenda of improving collaborative working in the construction industry via wider uptake of NMCP.

Literature Review

New Models of Construction Procurement (NMCP)

As highlighted by Ward (2019), the UK government introduced three new procurement models to be tested under the Government Construction Strategy 2011-2015; a

programme for which was established in 2012. They are Cost Led Procurement (CLP), Two-Stage Open Book (TSOB) and Integrated Project Insurance (IPI). Each of these new models represents evolution rather than revolution to overcome some of the common issues inherent within traditional project delivery (Lacey, 2014). A brief overview of the three procurement methods is given below to help the discussion on their potential contribution towards collaborative working, especially in public sector construction projects which were the initial target of the said three methods.

Cost-Led Procurement (CLP)

In CLP, the client organisation clearly defines the outcomes and requirements of a project in a strategic brief, engaging with the industry to set a challenging, yet realistic, cost ceiling (Burnand, 2014). The client may then engage with and work alongside supply teams within a framework agreement at the earliest possible point to develop a proposal that matches, or betters, the defined cost ceiling (Udom, 2012). The successful supply team is then selected according to their ability to work collaboratively with key stakeholders to develop the design and costing to deliver below the cost ceiling (Burnand, 2014) and to then achieve further reductions in subsequent projects (Udom, 2012).

Two-Stage Open Book (TSOB)

Under TSOB, a client would invite prospective supply teams based on an outline brief and cost benchmark, with several main contractors or consultants competing for the contract at this first stage (Mosey, 2014). Bidders are chosen based on stability, capacity, capability, experience and supply chain strength, as well as cost aspects such as overheads and profit (Mosey, 2014). Following the selection of the successful bidders, the second stage commences with the main contractor and consultant working

collaboratively alongside subcontractors and suppliers under a mutually agreed timetable (SCF, 2018b) to develop detailed proposals based on an open book cost (Mosey, 2014). TSOB also involves independent expert reviews of the scheme as a key feature, with recommendations made to the client and contractor alike for required improvements (Udom, 2012).

Integrated Project Insurance (IPI)

IPI is the most unique of the NMCP, comprising collaboration and risk management within an integrated project insurance product (Integrated Project Initiatives, 2014). Within IPI, the client appoints a project team under the guise of an 'alliance', based on aspects such as track record and capability (Udom, 2012). The alliance then operates within an environment of unrestricted collaboration to develop a project solution with savings against cost benchmarks. Such a proposal is then covered under a single insurance product, amalgamating all insurance policies held by the entire supply chain (Udom, 2012). Such insurance covers any cost overruns beyond a 'pain/gain share' threshold split transparently within the contracted parties, removing any potential for a blame culture (Integrated Project Initiatives, 2014). Before obtaining the insurance cover, however, any solution must be subjected to a thorough validation process by an independent expert ensuring that the project can be delivered (Integrated Project Initiatives, 2014) and that balanced commercial tension and good value are maintained.

Construction Procurement and Collaborative Working

The studies conducted by Tennakoon *et al.* (2021), Hughes (2012) and Norberg-Johnson (2015) outline the importance of collaboration in construction projects due to benefits that are achievable through collaborative working. Table I outlines the key benefits

attainable through collaborative working as postulated by previous studies. The benefits include but are not limited to transparent and manageable risks and opportunities, more appropriate and buildable solutions, enhanced innovation, staff/stakeholder satisfaction, enhanced problem solving and resolution. Cost and time savings have been mentioned by most of the scholars as common benefits of collaborative work (Perera *et al.*, 2020, Constructing Excellence, 2019b, Ellies 2018, Norberg-Johnson 2015 and Hughes *et al.*, 2012).

Table I: Benefits of Collaborative Working in construction

Feature	Bresnen & Marshall (2000b)	Hughes et al (2012)	Constructing Excellence (2019b)	Norberg-Johnson (2015)	Ellis (2018)	Total Mentions
PROJECT BENEFITS						
Transparent and Manageable Risks and Opportunities	✓	✓	✓			3
More Appropriate and Buildable Solutions	✓		✓			2
Enhanced Innovation	✓	✓	✓	✓		4
Staff/Stakeholder Satisfaction	✓	✓	✓		✓	4
Enhanced Problem Solving and Resolution	✓		✓			2
Enhanced Predictability of Outcomes			✓			1
Consideration of Whole Life Costing			✓			1
Cost and Time Savings	✓	✓	✓	✓	✓	5
Less Wastage		✓		✓	✓	3
Fewer Disputes and Easier Resolution	✓	✓		✓		3
Improved Supply Chain Management		✓				1
Improved Lead Times		✓				1
Enhanced Quality	✓			✓		2
Effective Capture of Client Requirements	✓			✓	✓	3
Better Decision Making				✓		1
Defect Prevention				✓		1
Enhanced Profit Margin		✓		✓	✓	2
INDUSTRY BENEFITS						
Prospect of Future Work/Long-Term Relationships	✓	✓		✓	✓	4
Marketability of Proven Track Record	✓	✓			✓	3

Competitive Market Advantage	✓	✓		✓	3
Enhanced Customer Satisfaction	✓	✓		✓	3
Improved Communication			✓		1
Less Wastage		✓		✓	2
Fewer Disputes and Easier Resolution	✓	✓	✓		3
Increased Knowledge Sharing				✓	1
Greater Technical Solutions			✓		1
Better Decision Making			✓		1
Continuous Improvement	✓	✓	✓		3

Bresnen and Marshall (2000a) have observed that the procurement method selected for a construction project has a significant impact on the level of collaboration achieved throughout the project. Thus, the above benefits of collaboration are depending on the method of procurement. When considering NMCP, Constructing Excellence (2019b), in their annual report to the Infrastructure and Projects Authority (IPA), highlight that both CLP and TSOB are becoming increasingly adopted, with an estimated £1 billion per year of projects utilising these two methods at the end of 2018. It emphasises the growing usage and therefore the importance of the NMCP to the construction industry. Hence, there is a need to investigate the NMCP thoroughly in terms of their collaborative features and potential contribution towards collaborative working in construction.

Collaborative Features within the NMCP

Each of the NMCP aligns with the ongoing shift to increased involvement from clients in construction procurement, which is highlighted in reports by Edum-Fotwe, *et al.* (2005) through enhanced collaborative working, among other common themes. Application of a robust review process, innovation-driven, fostering long-term relationships, early

contractor engagement, supply chain collaboration, reduced fragmentation and elimination of waste are among the other common themes (Ward, 2019).

As stated by Ward (2019), NMCP utilise collaborative working as a central feature. Subsequently, each model includes various techniques for collaborative working, as evidenced by both official guidance documents and trial projects. Table II below gives a summary of the collaborative techniques utilised within each of the NMCP, highlighting common themes between the models and any discrepancies between the guidance documents and trial projects.

Table II: Collaborative Features within the NMCP

	CLP		**IPI**		**TSOB**	
Feature	Guidance	Trials	Guidance	Trials	Guidance	Trials
Early Contractor Involvement	✓	✓	✓	✓	✓	✓
Gain/Pain Sharing Mechanisms	✓	✓	✓	✓		
Foster Long-Term Relationships	✓	✓			✓	✓
Integrated Project Team/Supply Chain	✓	✓	✓	✓	✓	✓
Environment of Mutual Trust and Co-operation	✓	✓	✓	✓	✓	✓
Joint Risk Management		✓	✓	✓	✓	✓
Open Book Costing/Working	✓	✓	✓	✓	✓	✓
Team Building/Training Workshops	✓	✓	✓		✓	✓
Shared Common Goal		✓	✓	✓	✓	✓
Team Performance Measures		✓				
Stakeholder Engagement	✓	✓				
Engage with Framework(s)	✓				✓	✓

Managed Relationships	✓		✓	✓	✓	✓
Dispute Resolution Procedure	✓		✓	✓	✓	✓
Understanding of Responsibilities	✓		✓		✓	✓
Setting of Incentives	✓		✓			
'No Blame/No Claim' Environment			✓	✓		
'Flat Team Structure'			✓			
Project Bank Accounts			✓			✓
Independent Facilitator for Collaboration			✓			
Waste Elimination Workshops			✓			
Early Warning Procedures			✓			
Joint Value Management					✓	✓
Co-Located Team					✓	✓
Supply Chain Collaboration Toolkit						✓
Shared Facilities Between Organisations					✓	✓
Planned Collaborative Processes					✓	

(Adapted from Burnand, 2014; Davis 2018; Integrated Project Initiatives, 2014; Mosey, 2014; Mosey and Ahearn, 2015)

Findings in Table II show that features such as 'Early Contractor Involvement' have been identified in all three procurement models. Gain and pain sharing mechanisms, fostering long-term relationships, integrated project teams and supply chains, joint risk management are among the other features that facilitate collaboration. The analysis, on one hand, shows that whilst some of the features (e.g. early contractor involvement) mentioned in guidance documents have been observed in trial projects, some have

either not been observed or not mentioned in trial project reports (e.g. independent facilitator for collaboration). This suggests that more needs to be done in practice to realise the true benefits of collaboration possible in NMCP. On the other hand, the trial projects seem to have unearthed collaborative features which are not specifically mentioned in the guidance documents (e.g. supply chain collaboration toolkit). This suggests that the NMCP also seem to offer collaborative benefits over and above what was specifically anticipated in the guidance documents. It also has to be noted that most of the collaborative features are not new to NMCP, but have existed before their invention. Instead, it can be argued that what NMCP have sought to achieve is to amalgamate many of the collaborative features under one roof deliberately to deliver a more collaborative environment.

Barriers to collaboration in the Construction Industry

Despite the aspiration to promote collaborative working, numerous barriers that are well defined in literature seem to impede the implementation of collaboration, both in the construction industry and beyond (Nawi *et al.*, 2019). Such barriers could also impede the uptake of the NMCP over more traditional forms of construction procurement, as NMCPs are seen as initiatives that demand a greater degree of collaborative working and commitment in this regard.

As highlighted by authors such as Baiden, *et al.* (2006), Bishop, *et al.* (2008), Eriksson, *et al.* (2008) and Kwofie, *et al.* (2018), one of the most cited barriers to collaborative working in the construction industry is social or cultural barriers, relating to the attitudes to change from those working within the industry, of which there are many. Tennakoon

*et al.(*2021) argue that the lack of a learning culture is key to preventing the implementation of collaborative working. Furthermore, as stated by Baiden, *et al.* (2005) and Eriksson, *et al.* (2008), the traditional focus on short-term profits that is widespread within construction directly impedes the collaborative ethos due to heavy time and resource commitments before realisation of increased profitability and continuous improvement.

As stated by Bishop, *et al.* (2008) and Eriksson, *et al.* (2008), further barriers to collaborative working can be attributed to both organisational and industry factors. For example, the competitive tendering habits of client organisations directly hinder the integration of both work tasks and the project team, leading to the development of adversarial relationships (Bishop, *et al.,* 2008; Eriksson, *et al.,* 2008), and a decrease in flexibility (Bayliss, *et al.,* 2004). Furthermore, the aforementioned lack of a training culture directly results in a lack of competence of organisations in implementing a collaborative approach to construction (Ng, *et al.,* 2002).

Eriksson, *et al.* (2008) argue that inhibitions result from powerful labour organisations and trade unions predominantly operating in an environment that obstructs and inhibits change through a focus on maintaining the status quo. Additionally, Ng, *et al.* (2002) state that the facilitation of competitiveness to strive away from biased decisions in the awarding of contracts within public procurement is directly adversarial to the concept of collaborative relationships. Barlow, *et al.* (1997) argue that standard, traditional construction contracts do much to suppress the formation of good working relationships.

Mosey (2014) has suggested that the barriers to collaboration shall be eliminated through NMCP. Hence, within this study, the barriers to collaboration in NMCP are investigated to provide a better understanding of the applicability of NMCP widely in the construction industry.

Strategies to overcome barriers to collaborative working

As mentioned previously, the NMCP attempted to integrate provisions to offset the barriers to collaborative working within the construction industry, employing features that can be directly attributed to strategies that are well versed within the literature. However, uptake of the NMCP has been slow when compared with more traditional forms of procurement; highlighting that more attention and focus must be directed towards the implementation of such strategies, potentially separate from the NMCP. For example, authors such as Bishop, *et al.* (2008) and Challender, *et al.* (2019) argue for increased inclusion of collaborative working and collaborative approaches to procurement within the curriculum for construction courses, alongside further education through emphasis on employers to provide collaboration-specific CPD courses. Additionally, as highlighted by Eriksson, *et al.* (2008), Farrell (2014), Kwofie, *et al.* (2018) and Challender, *et al.* (2019), a cultural shift towards the awarding of contracts based not only on price but also on further 'soft' parameters, such as commitments/attitudes towards collaborative working, makes this an essential factor in meeting business needs.

A further strategy, as cited by Bresnen and Marshall (2000b), is the setting of incentives for project partners to work in a fashion to encourage collaboration. Eriksson, *et al.* (2008) also discussed that the adoption of a more long-term focus from organisations

could result in a shift from traditional, short-term and profit-focused approaches. Such change could be achieved through further engagement with frameworks, especially within the private sector. Additionally, as stated by Barlow, *et al.* (1997), avoidance of rigid, formal forms of standard contracts that do not focus on collaboration could do much regarding the elimination of industrial barriers to collaborative working.

A common strategy cited by authors such as Eriksson, *et al.* (2008), Kwofie, *et al.* (2018), and Xie, *et al.* (2010) is improved, innovative or pre-defined communication procedures, effective in eliminating barriers that appear as a result of poor information sharing and encouraging trust between team members. In the development of a decision-making framework for collaborative working, Shelbourn, *et al.* (2007) refer to numerous strategies to facilitate collaboration within the construction industry. Such strategies include the appointment of a collaboration champion for a project; clearly allocated resources for collaborative working activities/facilitation; assessment of risks to collaboration and potential solutions such as identification of technological requirements; pre-agreed standards; and constant reflection and feedback on collaborative performance.

Even though strategies have been suggested in various literature, the lack of a study that positions the NMCP based on their effectiveness in eliminating barriers to collaboration, and gaining the benefits of collaboration is evident. Hence, the collaborative features of NMCP are explored in this paper based on the insights of industry professionals to strategically eliminate the barriers to collaboration and maximising the benefits of collaboration.

Research Method

Data collection

A questionnaire survey was conducted to obtain the views of construction professionals. Authors such as Hoxley (2008), Wedawatta *et al.* (2011) and Holt (2014), each state that questionnaires are intended for the measurement of people's attitudes; meaning that this method is highly appropriate for gathering/surveying the views of industry professionals. This is backed up by Naoum (2019), who states that questionnaires are frequently utilised for analytical research. Furthermore, the questionnaire survey method has been widely used within similar studies, for example by Hatkar and Hedaoo (2016) and Akintan and Morledge (2013).

Following the sample selection procedure of Ruparathna and Hewage (2015), where sustainable procurement practices in Canadian construction were assessed, the sampling frame for the questionnaire survey was obtained from a list of construction organisations operating within the UK construction industry. Requests to participate in the survey were made to randomly selected construction organisations and a total of 40 respondents agreed to participate. 82.5% response rate was reported as 33 questionnaires returned out of the 40 questionnaires distributed. According to the central limit theorem in statistics, the sample distribution is acceptable if the sample size is 30 (Levine, *et al.*, 2011). Therefore, the received responses from the sample were considered a fair representation of the population.

As detailed in Table III below, each respondent was also given a code from RE1 to RE33, allowing straightforward references to be made in the analysis. Hence, the background

of respondents could be referred to when utilising a specific response. Further analysis could take place, evaluating and exploring the causation of the results received, leading to the formation of recommendations to improve or eliminate barriers to collaboration within the NMCP.

Table III: Respondents' Demographic Distribution

Reference	Job Title/Profession	Organisation work for	Level of Experience	Experience with NMCP
RE1	**Quantity Surveyor**	**Consultant**	**0-5 years**	**No**
RE2	**Senior Quantity Surveyor**	**Consultant**	**20-30 years**	**Yes**
RE3	**Commercial Manager**	**Contractor**	**30+ years**	**No**
RE4	**Quantity Surveyor**	**Consultant**	**5-10 years**	**No**
RE5	**Project Manager**	**Consultant**	**0-5 years**	**No**
RE6	**Commercial Director**	**Consultant**	**10-20 years**	**Yes**
RE7	**Senior Project Manager**	**Consultant**	**10-20 years**	**No**
RE8	**Assistant Cost Manager (PQS)**	**Consultant**	**0-5 years**	**No**
RE9	**Cost Manager**	**Consultant**	**0-5 years**	**No**
RE10	**Assistant Quantity Surveyor**	**Consultant**	**0-5 years**	**No**
RE11	**Senior Project Manager**	**Consultant**	**30+years**	**Yes**
RE12	**Quantity Surveyor**	**Contractor**	**10-20 years**	**Yes**
RE13	**Quantity Surveyor**	**Contractor**	**5-10 years**	**Yes**
RE14	**Contract Manager**	**Contractor**	**30+ years**	**Yes**
RE15	**Senior Cost Consultant**	**Consultant**	**10-20 years**	**No**
RE16	**Building Surveyor**	**Consultant**	**5-10 years**	**Yes**
RE17	**Senior Project Manager**	**Contractor**	**10-20 years**	**Yes**
RE18	**Quantity Surveyor**	**Consultant**	**30+years**	**Yes**
RE19	**Quantity Surveyor**	**Consultant**	**5-10 years**	**No**
RE20	**Project Manager**	**Contractor**	**20-30 years**	**No**
RE21	**Project Manager**	**Client Organisation**	**10-20 years**	**No**

RE22	**Project Manager**	**Client Organisation**	**5-10 years**	**No**
RE23	**Project Manager**	**Client Organisation**	**0-5 years**	**No**
RE24	**Quantity Surveyor**	**Consultant**	**10-20 years**	**Yes**
RE25	**Project Manager**	**Consultant**	**30+years**	**Yes**
RE26	**Building Surveyor**	**Consultant**	**0-5 years**	**Yes**
RE27	**Quantity Surveyor**	**Consultant**	**10-20 years**	**No**
RE28	**Director**	**Consultant**	**20-30 years**	**No**
RE29	**Director/Quantity Surveyor**	**Contractor for 26 years/Private developer for 3 years**	**20-30 years**	**No**
RE30	**Design Manager**	**Contractor**	**10-20 years**	
RE31	**Director**	**Project Facilitators**	**30+ years**	**Yes**
RE32	**Commercial Manager**	**Contractor**	**30+ years**	**Yes**
RE33	**Commercial Manager**	**Consultant**	**20-30 years**	**No**

The sample consists of directors, project managers, commercial managers, cost managers, quantity surveyors and design managers working for construction contracting organisations, consultancies and clients. In the main, the sample consisted of consultancies and contractors, making up 61% and 27%, respectively, allowing comparisons to be made between the perspectives of those working for consultancies and contracting organisations. More than 64% of those in the sample had worked for more than ten years in the industry; adding strength to the analysis and recommendations made. Approximately half of the sample had worked directly in projects procured using the NMCP, and others had worked in projects adopting collaborative principles. While experience working under the NMCP was not a pre-requisite to completing this questionnaire, a strong representation of individuals with this experience suggests a high level of validity for the data received (when coupled with

those without experience working with the NMCP but with good experience working in construction) in analysing the views/perceptions of industry practitioners.

Data analysis

The Relative Importance Index (RII) method was used to rank the collaborative features, barriers to collaboration and strategies to overcome the barriers. As stated by Holt (2014), RII is often used to analyse data obtained from response scales in questionnaires, used by authors such as Hatkar and Hedaoo (2016) and Rooshdi *et al.* (2018). RII enables identification/prioritisation of the most important criteria from indicators rated on the Likert Scale (Rooshdi, *et al.,* 2018), and is more accurate in calculating an average index (Holt, 2014). A five-point Likert Scale was adopted ranging from 0.00–1.00. For an instance, when the respondents were asked to "Assess the level of effectiveness of 'Early Contractor Involvement' of NMCP in creating a collaborative environment", the respondent may select from ranges of 0.00–0.20, 0.20–0.40, 0.40–0.60, 0.60–0.80 and 0.80-1.00 represented the significance levels of 'Very Ineffective (VI)', 'Ineffective (I)', 'Neither Effective nor Ineffective (NE)', 'Effective (E)' and 'Very Effective (VE)', respectively.

The formula for RII is $RII = \sum W/AN$; where W is the sum of the scores awarded to a variable, A is the largest integer on the response scale and N is the number of respondents (Holt, 2014). Utilising the formula, both collaborative features of the NMCP and methods by which to eliminate barriers to collaborative working were measured. Following calculation of the RII, detailed analysis is undertaken with factors ranked according to the RII score.

Findings and Discussion

The NMCP were introduced by the UK government as an alternative approach towards procurement, designed to eliminate waste and deliver better value. The newly introduced procurement models sought a more collaborative, integrated model which still maintains healthy competition and delivers value for money. This research sought to investigate whether the construction industry is in agreement with the delivery of collaborative benefits intended by these procurement models. Since the effect of the collaboration may differ based on the interest of the contracting parties of construction projects, the views of the individuals working in contractor organisations and consultancy firms were analysed separately.

Overall viewpoint on collaborative features of the NMCP

Table IV summarises the findings regarding the overall viewpoint of the sample, focusing on RII value ranked separately between the NMCP features and those uncovered in the literature review, in descending order. Overall, between the NMCP features, the RII values calculated ranged between 0.90 and 0.61. This suggests a relatively limited range of views regarding the effectiveness of collaboration within the NMCP, with each factor being viewed as either VE or E, which is confirmed through the average RII value of 0.74 being represented as E. This suggests that all the collaborative features surveyed are deemed important by the respondents.

Table IV: Overall Viewpoint of Collaborative Features in NMCP

Reference	Feature	RII	RII Ranking	LoE
F1	**Early Contractor Involvement**	**0.90**	**1**	**VE**
F10	**Understanding of Responsibilities**	**0.86**	**2**	**VE**
F33	**Reliable Supply Chain**	**0.83**	**1**	**VE**

F3	**Environment of Mutual Trust, Co-operation and Open Dialogue**	**0.85**	**3**	**VE**
F12	**Foster Long-Term Relationships**	**0.84**	**4**	**VE**
F17	**Stakeholder Engagement**	**0.83**	**5**	**VE**
F2	**Integrated Project Team/Supply Chain**	**0.82**	**6**	**VE**
F29	**Fair Allocation of Risk**	**0.82**	**2**	**VE**
F7	**Shared Common Goal**	**0.82**	**7**	**VE**
F4	**Joint Risk Management**	**0.80**	**8**	**VE**
F22	**Early Warning Procedures**	**0.79**	**9**	**E**
F30	**Defined Communication Procedures**	**0.79**	**3**	**E**
F28	**Collaborative Technologies**	**0.78**	**4**	**E**
F32	**Sharing of Positive Activities**	**0.78**	**5**	**E**
F23	**Joint Value Management**	**0.77**	**10**	**E**
F27	**Planned Collaborative Processes**	**0.77**	**11**	**E**
F8	**Managed Relationships**	**0.76**	**12**	**E**
F13	**Engage with Framework(s)**	**0.75**	**13**	**E**
F14	**Setting of Contractual Incentives**	**0.73**	**14**	**E**
F9	**Dispute Resolution Procedure**	**0.72**	**15**	**E**
F18	**'No Blame/No Claim' Environment**	**0.72**	**16**	**E**
F5	**Open Book Costing/Working**	**0.72**	**17**	**E**
F11	**Gain/Pain Sharing Mechanisms**	**0.71**	**18**	**E**
F21	**Effort to Reduce Wastage**	**0.70**	**19**	**E**
F24	**Co-Located Team**	**0.70**	**20**	**E**
F31	**Accessible Accounts**	**0.70**	**6**	**E**
F6	**Team Building Events/Workshops**	**0.68**	**21**	**E**
F25	**Supply Chain Collaboration Toolkit**	**0.66**	**22**	**E**
F26	**Shared Facilities**	**0.65**	**23**	**E**
F20	**Independent Facilitator for Collaboration**	**0.64**	**24**	**E**
F16	**Team Performance Measures**	**0.64**	**25**	**E**
F15	**Project Bank Accounts**	**0.62**	**26**	**E**
F19	**"Flat Team Structure"**	**0.61**	**27**	**E**
***LoE: Level of Effectiveness**				
****VE: Very Effective; E: Effective**				

With a value of 0.90, F1 'Early Contractor Involvement' (ECI) was ranked first in terms of effectiveness. This could be due to the many benefits of ECI; the most notable of which is the contribution from the contractor into design development and planning (Hill,

2019), improving the effectiveness of the entire project team during the early stages of a project through wider knowledge and specialisations. ECI is a distinguishing feature when designing NMCP (Cabinet Office,2014) focusing expedition of the construction process and it brings about the deliverables of collaborative working at the same time.

Overall, out of the 30 features of NMCP 10 features have been distinguished as very effective in creating a collaborative environment. Understanding of responsibilities, reliable supply chain, environment of mutual trust, co-operation and open dialogue, foster long-term relationships, stakeholder engagement, integrated project team/supply chain, fair allocation of risk, shared common goal, joint risk management are among the most effective collaborative features. These features have been observed in earlier procurement methods as well, and are not new to NMCP. However, there is no single procurement method that could be singled out with most of the above collaborative features. What the industry has mainly sought to do previously is to integrate different collaborative features to existing procurement methods in an ad-hoc manner. The NMCP is an answer for that and a well-designed substitute for the ad-hoc procurement methods the construction industry has been using to achieve collaboration. The key advantage offered by NMCP is that all 3 methods include a range of collaborative features – offering the ability to achieve greater collaboration in a project.

Moreover, the findings shown in Table IV are a representation of the collective perception of the respondents working for Consultants and Contractors. Hence, the findings also outline the willingness of the consultants to get the Contractor involved in the project as early as possible. TSOB method in NMCP leverages that by, getting the

main contractor involved in the project at the begging and planning the project with their involvement. Unlike earlier methods (e.g. traditional procurement), TSOB has such provisions to collaborate.

Conversely, the lowest-ranked feature is F19, 'Flat Team Structure', with a value of 0.61. While this is still ranked as E, there is a reasonable disparity between F19 and F1 of 0.29; indicating a reasonable difference in how different features are viewed in terms of effectiveness. This could be due to features such as a flat team structure being relatively unique concepts, only being featured within IPI but not on TSOB or CLP.

Comparison of viewpoints of consultants and contractors

Table V provides a comparison of the viewpoint of the individuals working for consultancies and contractor organisations. The RII values obtained by the collaborative features have noteworthy similarities and differences between the two subsets of the sample. As shown in Table V, when solely taking consultants' viewpoints into account, the RII values obtained for the NMCP features range between 0.84 and 0.59, with an average of 0.73; meaning a range of effectiveness between VE and NE. Additionally, the consultants surveyed only viewed six features as VE, as opposed to thirteen features viewed as VE by contractors. Although differences are relatively minor, this suggests that those industry practitioners working within consultancies take a more critical view of collaboration within the NMCP; inferring inefficiencies in terms of collaborative working.

Table V: Comparison of Viewpoints of Consultants and Contractors

Consultants' Viewpoint of Collaborative Features	Contractors' Viewpoint of Colloborative Features

Ref.	Feature	RII	RII Ranking	LoE	Ref.	Feature	RII	RII Ranking	LoE
F1	Early Contractor Involvement	0.84	1	VE	F1	Early Contractor Involvement	1.00	1	VE
F10	Understanding of Responsibilities	0.83	2	VE	F2	Integrated Project Team/Supply Chain	0.93	2	VE
F3	Environment of Mutual Trust, Co-operation and Open Dialogue	0.82	3	VE	F3	Environment of Mutual Trust, Co-operation and Open Dialogue	0.91	3	VE
F12	Foster Long-Term Relationships	0.82	3	VE	F10	Fair Allocation of Risk	0.91	3	VE
F7	Shared Common Goal	0.80	5	VE	F4	Understanding of Responsibilities	0.89	5	VE
F17	Stakeholder Engagement	0.80	5	VE	F7	Joint Risk Management	0.87	6	VE
F8	Managed Relationships	0.78	7	E	F12	Reliable Supply Chain	0.87	6	VE
F33	Reliable Supply Chain	0.79	8	E	F29	Shared Common Goal	0.84	8	VE
F2	Integrated Project Team/Supply Chain	0.77	9	E	F14	Foster Long-Term Relationships	0.84	8	VE
F4	Joint Risk Management	0.77	9	E	F17	Sharing of Positive Activities	0.84	8	VE
F30	Defined Communication Procedures	0.77	9	E	F33	Setting of Contractual Incentives	0.82	11	VE
F28	Collaborative Technologies	0.77	9	E	F32	Stakeholder Engagement	0.82	11	VE
F22	Early Warning Procedures	0.76	13	E	F22	Early Warning Procedures	0.80	13	VE
F27	Planned Collaborative Processes	0.76	13	E	F11	Gain/Pain Sharing Mechanisms	0.78	14	E
F29	Fair Allocation of Risk	0.76	13	E	F30	'No Blame/No Claim' Environment	0.78	14	E
F13	Engage with Framework(s)	0.74	16	E	F18	Joint Value Management	0.78	14	E
F23	Joint Value Management	0.74	16	E	F23	Open Book Costing/Working	0.76	17	E
F9	Dispute Resolution Procedure	0.73	18	E	F5	Engage with Framework(s)	0.76	17	E
F32	Sharing of Positive Activities	0.73	18	E	F28	Planned Collaborative Processes	0.76	17	E

F24	**Co-Located Team**	**0.71**	**20**	**E**	**F13**	**Defined Communication Procedures**	**0.76**	**17**	**E**
F25	**Supply Chain Collaboration Toolkit**	**0.70**	**21**	**E**	**F27**	**Collaborative Technologies**	**0.76**	**17**	**E**
F5	**Open Book Costing/Working**	**0.69**	**22**	**E**	**F8**	**Managed Relationships**	**0.71**	**22**	**E**
F6	**Team Building Events/Workshops**	**0.69**	**22**	**E**	**F6**	**Team Building Events/Workshops**	**0.69**	**23**	**E**
F21	**Effort to Reduce Wastage**	**0.68**	**24**	**E**	**F21**	**Effort to Reduce Wastage**	**0.69**	**23**	**E**
F14	**Setting of Contractual Incentives**	**0.67**	**25**	**E**	**F24**	**Accessible Accounts**	**0.69**	**23**	**E**
F11	**Gain/Pain Sharing Mechanisms**	**0.67**	**25**	**E**	**F9**	**Co-Located Team**	**0.67**	**26**	**E**
F18	**'No Blame/No Claim' Environment**	**0.67**	**25**	**E**	**F15**	**Dispute Resolution Procedure**	**0.62**	**27**	**E**
F20	**Independent Facilitator for Collaboration**	**0.67**	**25**	**E**	**F16**	**Project Bank Accounts**	**0.62**	**27**	**E**
F31	**Accessible Accounts**	**0.67**	**25**	**E**	**F31**	**Team Performance Measures**	**0.58**	**29**	**NE**
F26	**Shared Facilities**	**0.66**	**30**	**E**	**F19**	**'Flat Team Structure'**	**0.58**	**30**	**NE**
F16	**Team Performance Measures**	**0.62**	**31**	**E**	**F20**	**Independent Facilitator for Collaboration**	**0.58**	**31**	**NE**
F19	**'Flat Team Structure'**	**0.61**	**32**	**E**	**F26**	**Shared Facilities**	**0.58**	**32**	**NE**
F15	**Project Bank Accounts**	**0.59**	**33**	**NE**	**F25**	**Supply Chain Collaboration Toolkit**	**0.58**	**33**	**NE**
***LoE: Level of Effectiveness**									
****VE: Very Effective; E: Effective; NE: Neither Effective or Ineffective**									

In the contractors' view, the RII values for the NMCP features range between 1.00 and 0.58; a wider range than the consultants' viewpoint. This suggests that, of those surveyed, contractors have much more mixed views on the effectiveness of different collaborative features within the NMCP; likely due to proximity in terms of working on a project. Typically, an individual working for a contracting organisation would engage

with a project on a more in-depth level, whereas those working as consultants may be involved with numerous projects simultaneously at a higher level.

Overall, it is apparent that common themes are prevalent within the primary research in terms of the effectiveness of collaborative features, with numerous aspects retaining similar rankings and values; demonstrating that similar views are held between each type of organisation. From the finding of multiple similarities in views, it is possible to make strong recommendations that would satisfy both consultants and contractors, giving a high level of validity. Most importantly, a feature that was identified as the most effective by both contractors and consultants, 'Early Contractor Involvement', has been identified in most of the key literature sources such as Burnand (2014) and Davis (2018), as detailed in **Error! Reference source not found.**I. It can be observed that this opportunity has been greatly received by those representing contracting organisations (RII value of 1.00 compared to 0.84 awarded by consultants). Other top-five collaborative features were also noticed in all trial studies completed employing CLP, TSOB and IPI (Davis, 2018; Integrated Project Initiatives, 2014; Mosey, 2014). It is recommended that, to improve collaboration within the NMCP, the less effective formal mechanisms can be replaced by other features prevalent within the literature and outlined in Table I, with an extra commitment made to the most effective. For example, a supply chain collaboration toolkit could be replaced by a more flexible and reliable approach to supply chain management. Replacement rather than further incorporation would allow focus in practice to be granted to beneficial features, saving on resources and therefore likely improving uptake of collaborative working and the NMCP.

It could be observed that the number of collaborative features exploited by the industry practitioners through employing the NMCP was higher than the highlighted features

within the literature sources such as Ward (2019). RE11 highlighted “genuine mutual win-win scenarios that are set and then could be demonstrated” with the use of the new models of procurement. Moreover, RE15 stated that “I am a bit more cynical when it comes to the costing side of the collaborative approaches employed. However, if there are greater checks on the contractors’ activities, it would go a long way to encourage me to strive for better collaboration”. In Table I, 27 collaborative features are discerned, and more collaborative features, such as joint risk management, open-book costing, joint value management, and co-located teams were identified by the respondents. In the process of establishing the analysed collaborative features, it should be emphasised that the respective RII of them only ranges from VE to E. This demonstrates that no feature in Table VI could be neglected as ineffective for the collaboration process.

Enhancing collaboration in the NMCP

While outlining the features that allow collaboration, the respondents highlighted the barriers hindering the contracting parties of the construction projects to work collaboratively. As explained by RE1 and many of the respondents, a culture of trust between the contracting parties is lacking to make collaboration work. This has also been mentioned by authors such as Eriksson, *et al.* (2008). R8, a respondent representing contractor organisations, highlighted that *“the tight margins which cause contractors to be sneaky with costs prevents an open book model from working...”.* Yet, as explained by Kwofie, *et al.* (2018), being an industry relying mainly on contractual relationships for a long time, adapting to a collaborative culture that goes beyond the norm could be a difficult task.

Among other barriers, the lack of communication skills is also indicated by several respondents. RE14 explained that the different mindsets of individuals and the capacity for understanding the underlying assumptions make it difficult to mutually work towards a common goal while having different interests. RE11 stated: *"Project duration is a concern when investing in collaborative tools"*. Furthermore, in his opinion, the cost of adapting to a novel method for procurement could be seen as ineffective when the project duration is short. R17 emphasised the view that "investment in collaborative working is an overhead cost that is not recoverable" is a barrier to implementing novel methods of procurement that allows collaboration.

However, the respondents were confident that most of these barriers could be overcome by strategic employment of the NMCP. The views of industry practitioners concerning the effectiveness of strategies by which to eliminate barriers to collaborative working are shown in Table VI below. This details the findings for the overall viewpoint of the sample, focusing on RII values ranked in descending order.

Table VI: Effectiveness of Strategies to overcome Barriers to collaborate

Reference	Strategy	RII	RII Ranking	LoE
S4	**Contractual incentives**	**0.81**	**1**	**VE**
S7	**Improved communication procedures**	**0.81**	**2**	**VE**
S11	**Constant reflection and feedback**	**0.81**	**3**	**VE**
S3	**Increased emphasis on commitments to collaborative working in awarding of contracts**	**0.80**	**4**	**VE**
S10	**Assessment of risks to collaborative relationships**	**0.76**	**5**	**E**
S9	**Allocated resources to facilitate collaborative working**	**0.75**	**6**	**E**
S5	**Further engagement with procurement frameworks**	**0.75**	**7**	**E**
S2	**Inclusion of collaborative approaches within construction courses**	**0.73**	**8**	**E**
S1	**Increased emphasis on collaborative working CPD**	**0.70**	**9**	**E**
S6	**Avoidance of rigid standard forms of contract**	**0.57**	**10**	**NE**
S8	**Appointment of 'collaboration champion'**	**0.57**	**11**	**NE**

AVERAGE	**0.73**	**E**
*LoE: Level of Effectiveness		

Overall, the RII values received range between 0.81 and 0.57, with the level of efficiency ranging between VE and NE. The average RII of 0.73 can be categorised as E. Similarly, this range is relatively similar for collaborative features, indicating shared views across the sample.

Table VI demonstrates that each of the top three ranked strategies shares the same RII value of 0.81, and therefore presumed as a very effective strategy, which is also applicable to 'Increased emphasis on commitments to collaborative working in awarding of contracts' (value of 0.80). Interestingly, this contradicts some of the findings relating to collaboration within the NMCP. This is because, aside from 'Constant reflection and feedback', each of these strategies relates to formal, contractual initiatives by which to improve facilitation of collaborative working (particularly 'Increased emphasis on commitments to collaborative working in awarding of contracts' and 'Contractual incentives'). Respondents RE10, RE21 and RE28 held similar views. According to RE21, better contractual incentives will ensure that the project team members willingly collaborate.

On the other hand, RE14 pointed out the importance of a no-blame culture, where the risks and rewards of the project are mutually shared based on understanding. Non-monetary incentives such as appointing a 'collaboration champion' have been identified as not being very effective. This seems to indicate an overall view that barriers to collaborative working could be eliminated through a focus on driving collaboration

through the contract itself, rather than allowing relationships to form naturally, which is further backed up through 'Avoidance of rigid standard forms of contract' being ranked as not effective.

Additionally, 'Inclusion of collaborative approaches within construction courses' and 'Increased emphasis on collaborative working CPD' being ranked as eight and nine, respectively, suggests a view that the training of individuals in collaboration, though still effective, is inconsequential when compared with contractual factors. On the other hand, however, 'Appointment of collaboration champion', a strategy designed to facilitate collaboration via a formal appointment, is ranked as least effective, and 'Improved communication procedures', which avoids contractual means, shares the top ranking. This suggests mixed views relating to the type of strategy that is effective in eliminating barriers; indicating that a universal approach is unsuitable.

When the 2 subsets of the consultants and contractors are considered, it was noted that the strategy of 'Increased emphasis on commitments to collaborative working in awarding of contracts' was ranked as the most important by the contractor group (REI 0.87), whereas this was ranked fourth by the consultant group (REI 0.75). This disparity suggests that consultants hold the inclusion of collaborative working as a criterion for awarding contracts in lower esteem than the contractors. A possible reason for this is the lack of trust between parties within the industry. Traditionally, upon receipt of tender submission, a consultant would undertake a critical review with the client's best interests in mind. In a truly collaborative environment, this would not be necessary. The lower ranking of 'Increased emphasis on commitments to collaborative working in

awarding of contracts' indicates that, should commitments to collaborative working be included within a tender, a consultant would still be sceptical of the contractor, demonstrating a lack of trust; a common theme in the literature review. This is supported by answers to the question 'Which, if any, barriers/issues do you believe impede collaborative working within the construction industry?', of which lack of trust is a common theme in answers such as "Secrecy from contractors and designers" (RE9), "Contractors being sly and hiding information" (RE10) and "The industry is rife with distrust between parties" (RE4). These comments add further weight to arguments highlighted in the literature review. According to Kwofie, *et al.* (2018) and Challender, *et al.* (2019), a cultural shift towards awarding of contracts based not only on price but also on the intangible parameters related to the commitment, attitude and approach to collaboration is needed, making it an essential factor in meeting business needs.

Among the strategies to overcome barriers and to improve collaboration, contractual incentives have been recognised as one of the most effective strategies. It has to be noted that standard form contracts such as the New Engineering Contracts (NEC4) contain the provisions for incentivising performance such as collaborative working. Therefore, this is an achievable strategy. Improving communication during the procurement stage, constant refection and feedback and increased emphasis on commitments to collaborative working in the awarding of contracts are among the other strategies highlighted as most effective based on respondents' experience.

Overall, common themes are prevalent within the primary research in terms of the effectiveness of strategies by which to eliminate barriers to collaborative working. Most

strategies cited within the literature review maintain similar rankings in terms of RII and level of importance when the views of consultants and contractors are directly compared. Additionally, it could be said from the findings that the NMCP themselves do much to eliminate barriers to collaborative working.

The findings can be used by the industry to inform their decision making when selecting an appropriate procurement method for a construction project and to consider NMCP as viable options among other procurement methods available. Also, some lessons could help the industry irrespective of the procurement method. For instance, it was noted that the opportunity to get involved in a project early; i.e. early contractor involvement, was highly valued by those representing contracting organisations, over and above the significance associated by those representing consulting organisations. It was also noted that the role of Project Bank Accounts (PBAs) received a relatively low score for its ability to help collaboration between parties. This is contrary to wider benefits associated with PBAs and their ability to help payment practices, reduce disputes and enhance collaboration. The findings point to the need to educate the industry about the benefits offered by such new initiatives.

Conclusion

The collaborative feature viewed as most effective is early contractor involvement in a project, which was upheld by both contractors and consultants. Understanding of responsibilities, an environment of mutual trust, co-operation and open dialogue, fostering long-term relationships and stakeholder engagement are among other features that are perceived to be very effective in creating a collaborative construction project procurement environment. This suggests that, although these benefits are not

specifically mentioned in the NMCP documents, they are underlying features integrated within the models and that these benefits are delivered by the models.

Overall, this study indicates that there is general agreement among the study sample about the effectiveness of collaborative features integrated within the NMCP. It is clear that the novel construction procurement models contain features that facilitate collaboration, and the study has identified ways and means of improving the uptake of these collaborative practices to make the project environment more collective. Out of predefined strategies, the most effective strategies to improve collaboration have been acknowledged in the study. Further study is recommended to gather evidence of actual benefits delivered; perhaps via action or ethnographic research. While the sample of the study is sufficient as per the central limit theorem, evidence from a larger sample will help more concrete conclusions to be drawn. It also has to be noted that the study report's perceptions of the practitioners may be different from the actual benefits delivered.

This study makes a niche contribution to the knowledge base on the NMCP; a body of knowledge that needs to be further advanced if the adversarial and disintegrated industry is to be driven towards more collaborative working practices, as expected in recent government construction strategies. The findings reported affirms the collaborative benefits offered by NMCP, which could help convince the wider UK construction industry to adopt these new models of construction procurement in their projects. It was found that initiatives such as contractual incentives, improved communication procedures, constant reflection and feedback, greater emphasis on

commitment to collaborative working in awarding contracts as the most effective strategies to help address the barriers to collaboration and increase the use of NMCP. These strategies could be used by the government and other construction clients in their projects.

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