

White Paper on Procurement Strategies for Incentivizing Collaborative Delivery to Optimize Whole-life Outcomes



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This White Paper comprises the final outputs from a two-year research programme for the Centre for Digital Built Britain that was led by King's College London Centre of Construction Law and University of Cambridge Laing O'Rourke Centre.

This research forms part of the Centre for Digital Built Britain's (CDBB) work at the University of Cambridge. It was enabled by the Construction Innovation Hub, of which CDBB is a core partner, and funded by UK Research and Innovation (UKRI) through the Industrial Strategy Challenge Fund (ISCF).

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The research recommendations include sections which focus on how a collaborative approach to construction strategy, procurement, contracts and management can help to deliver whole life Net Zero targets and improve whole life building safety.

The research recommendations also link procurement, contracts and digital information management in compliance with ISO 19650 through the adoption of an 'Integrated Information Management Contract'. These recommendations align with the recommendations and requirements of the 2020 Construction Playbook, the 2021 Cabinet Office Gold Standard for Construction Frameworks and the 2022 DLUHC Guidance on Collaborative Procurement for Design and Construction to Support Building Safety.

A template for the Integrated Information Management Contract is provided separately and this remains the property of King's College London, as per article 5.1. under the Collaboration Agreement G104054 dated 5 November 2019 between The Chancellor, Masters and Scholars of the University of Cambridge and King's College London, reading that: 'All intellectual Property arising from the conduct of the Project ("the Arising Intellectual Property") shall be owned by the Party that generates them.' King's College London has the right to promote the adoption of the Integrated Information Management Contract unless and until a joint approach is agreed with Centre for Digital Built Britain.

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1 Introduction and overview

This White Paper is the final deliverable prepared by the King's College London Centre of Construction Law within the framework of the research programme: *'Procurement strategies for incentivizing collaborative delivery to optimize whole-life outcomes'* funded by the Centre for Digital Built Britain ('CDBB'). The research has explored procurement strategies to optimize whole-life outcomes through engagement with high-performing collaborative clients and teams. It has considered how the processes and relationships associated with collaborative construction procurement can be more closely integrated into the mainstream, and the roles that BIM and other digital technologies can play in facilitating and supporting this integration. This White Paper shows how successful clients, teams and programmes of work have delivered significant improvements in long-term performance by adopting collaborative approaches to their strategies, procurement, contracting and management.

The overarching objectives of this research comprised:

- Learning from the interactions between collaborative behaviours, collaborative procurement models, collaborative contracts and the use of digital technology; and
- Identifying the impact of collaborative construction and procurement techniques in achieving improved whole life project outcomes.

Pursuing these objectives led the research team to consider the following interrelated stages (the *'Four I's'*) of collaborative delivery:

- **Intention** – how does a client establish an appropriate strategy for optimizing whole-life value through collaborative construction?
- **Information**- what information needs to be exchanged in for a client and its industry bidders use the selection and evaluation process to understand each other's positions, reconcile their differing interests and optimize whole-life outcomes?
- **Integration** – how are relationships between all parties integrated so as to ensure that agreed exchanges take place at the times when they will be of most value to the optimization of whole-life outcomes?
- **Incentivisation** – why should the parties honour their mutual commitments to the optimization of whole-life outcomes?

The research team has explored the intellectual, practical and commercial relationships between collaborative team members and their impact on the realisation of strategic and project objectives. We have looked at the links between collaborative alliances at

a corporate and contractual level and also at the drivers for collaboration among the individuals engaged on a project or programme of work.

Through case studies, data analysis and lessons learned from past and present projects, this White Paper illustrates how collaborative approaches can be adopted successfully by teams in different construction and engineering sectors. It shows how whole life economic and social value can be optimized through improvements in strategic thinking, team selection, contract integration and the use of digital technology. It describes how high-performing collaborative teams have managed to improve productivity, reduce risks, avoid disputes and enhance the use of digital technology.

This White Paper illustrates how collaborative contractual mechanisms can enhance the use of digital tools, and it includes a model developed by the research team for meeting the collaboration requirements of ISO19650¹ through a multi-party '*Integrated Information Management Contract*'. It shows how this contractual instrument can fill the gaps in a collaborative approach to projects and programmes of work using BIM by enabling team members to agree and implement direct mutual commitments either on a single project (by integrating any combination of two-party project contracts) or on multiple projects (by integrating any combination of two-party and multi-party project contracts).

This White Paper shows how collaborative procurement and contractual strategies can optimize positive whole life carbon outcomes and help to deliver net zero targets. It highlights how procurement strategies for long-term appointments, combined with effective procurement processes and contracts, can help tackle climate change and improve sustainability.

2 Methodology and metrics

The main methodology used throughout the research programme is the legal empirical method, centred around case study analysis, particularly the qualitative analysis gained from the following sources: a) interviews and observation of case study meetings; b) study of project documents and other materials; c) analysis of case study strategic and project data; and d) responses to focused written enquiries addressed to case study participants as well as responses given during workshops.

¹ *ISO 19650*, BS EN ISO 19650 1&2:2018, Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)- Information management using building information modelling
<https://shop.bsigroup.com/ProductDetail?pid=00000000030333754>.

In line with *The Oxford Handbook on Empirical Legal Research*, empirical legal research entails ‘*the systematic collection of information/data and its analysis, according to an accepted method*’.² Broadly speaking, case studies and related analysis leading to arguments in relation to the reform of working practices are all empirical methods, as they are developed by reference to ‘*the real world*’.³ Empirical legal study can be qualitative or quantitative. Qualitative research with high-performing collaborative clients and teams created a case study dataset designed to cover:

- Different sectors
- Different stages of progress
- Different procurement models
- Different contract forms.

This dataset was also designed to include clients and teams who:

- Have already adopted BIM
- Are considering adopting BIM
- Do not intend to adopt BIM.

Collaborative clients and teams participating in the research programme signed a Memorandum of Understanding confirming that the research team would review collaborative processes and business models at a strategic and project level in order to develop a better understanding of ‘*cause-and-effect*’ in the successes and challenges of collaborative procurement.

The research team assessed the cause-and-effect relationships between collaborative procurement models, collaborative contracts and the collaborative use of digital technologies, together with their impact on improved value and outcomes. We used a range of relevant metrics such as cost, time, health and safety, quality, social value, net zero carbon and risk management, focusing in each case study on the most distinctive metrics. In establishing measures that create insights as to cause and effect, the research team concluded that conventional comparative and statistical assessments would not contribute to the understanding of the impact of the collaborative use of procurement models, contracts and digital technology.

² *The Oxford Handbook on Empirical Legal Research*, P. Cane, H.M. Kritzer, OUP, 2010.

³ *The Case for Case Studies in Empirical Legal Research* Argyrou, A., 2017, *Utrecht Law Review*, 13(3), pp.95–113.

The research team developed a tailored approach to obtain the results described in this White Paper. For example, in respect of risk management, we looked at:

- The ways in which a team deals collaboratively with significant risks before construction commences
- The ways in which a team deals collaboratively with significant risks arising during construction.

The research team has benefitted from cross-fertilisation between our work for CDBB and related pro bono work commissioned from King's College London Centre of Construction Law by Cabinet Office in relation to '*Constructing the Gold Standard*', an '*Independent Review of Public Sector Construction Frameworks*'⁴ and by the Department for Levelling Up Housing and Communities ('DLUHC') in relation to '*Guidance on Collaborative Procurement for Design and Construction to Support Building Safety*'⁵. We have also benefitted from ongoing related research for the Society of Construction Law in relation to the question '*How can construction procurement achieve net zero carbon?*'

The research team initially identified a heterogenic approach to the integration of digital tools and Building Information Management ('BIM') by collaborative teams, ranging across those projects that adopted successful strategic approaches to the use of BIM to those who made limited use of BIM. The research team identified the potential for significant impact in a new response to this heterogenic approach based on:

- The ISO19650:2018 standard which emphasises how '*collaboration between the participants involved in the construction projects and in asset management is pivotal to the efficient delivery and operation of assets*'⁶
- Previous King's research which explored interest in a multi-party BIM protocol⁷

⁴ *Constructing the Gold Standard*, December 2021, <https://www.gov.uk/government/publications/an-independent-review-of-public-sector-construction-frameworks>
<https://questions-statements.parliament.uk/written-statements/detail/2021-12-16/hcws502>
<https://questions-statements.parliament.uk/written-statements/detail/2021-12-16/hlws486> ;
<https://www.gov.uk/government/news/gold-standard-created-to-improve-public-sector-construction-projects>.

⁵ <https://www.gov.uk/government/publications/collaborative-procurement-guidance-for-design-and-construction-to-support-building-safety>

⁶ *ISO 19650:1*, p. VI.

⁷ *Enabling BIM Through Procurement and Contracts*, Centre of Construction Law, King's College London, 2016, <http://alliancecontractingelectroniclawjournal.com/wp-content/uploads/2019/10/Kings-College-London.-2016-Enabling-BIM-through-Procurement-and-Contracts-Centre-of-Construction-Law-and-Dispute-Resolution.pdf>

- The links between collaborative procurement and BIM which emerge as a central consideration in current initiatives such as the Government’s 2020 ‘*Construction Playbook*’⁸ and the ‘*Golden Thread*’ of digital data underpinning responses to the ‘*Building a Safer Future*’ consultation⁹.

The research team investigated ways to create a collaborative contractual medium supporting BIM and for applying the ISO19650 2018 published standards. The research has led us to conclude that an Integrated Information Management Contract could help users to overcome obstacles that impede the wider adoption of collaborative procurement and to overcome obstacles that impede the wider adoption of BIM. We concluded that a standard form of Integrated Information Management Contract could be based on a suitably populated version of the published ‘*FAC-1 Framework Alliance Contract*’¹⁰, which is recognised as a flexible and proven contractual medium for collaborative working.

A draft Integrated Information Management Contract was then issued on a confidential basis for consultation in May 2021 for consideration by a group of clients and industry professionals who have suitable experience of and commitment to collaborative procurement and the adoption of BIM. These included representatives of the UK BIM Alliance. Consultation feedback led to further dialogues, explanations and amendments to the Integrated Information Management Contract, including contributions provided by the UK BIM Alliance and by Crown Commercial Service, Faithful+Gould, Kier, Lendlease, Mace, Metre Sq, Ministry of Justice, PCSG, Trowers & Hamlins and Willmott Dixon. A subsequent and updated version of the Integrated Information Management Contract was released in July 2021, was subject to comments by the UK BIM Alliance and incorporates amendments in line with a number of their suggestions.

The research team have focused on two areas to illustrate the particular strengths of collaborative procurement:

- Net zero carbon in Section 7, partly with the benefit of related research for the Society of Construction Law
- Building safety in Section 8, partly with the benefit of related research for DLUHC.

⁸ <https://www.gov.uk/government/publications/the-construction-playbook>

⁹ <https://buildingasaferfuture.org.uk/>

¹⁰ <https://allianceforms.co.uk/fac-1/>

3 Perceived weaknesses in collaborative procurement

When collaborative approaches are proposed in order to improve construction procurement, the initial enthusiasm is often eroded by suggestions that particular changes are not possible or prudent, that they will cost extra money or take too much time and that they do not apply to the needs of a particular client or sector. In order to create new commercial norms, collaborative practices need to be practical, agile and commercially viable. Otherwise, they will soon become lost in the '*Bermuda Triangle*' of idealistic debate, cynical criticism and unrealised good intentions¹¹.

As a starting point the research team engaged with a range of high-performing teams in various sectors in order to explore perceived weaknesses in their approaches to collaborative procurement. Valuable information was shared by high-performing teams at a strategic and project level, both in writing and at a workshop led by King's College London Centre of Construction Law in November 2020. This section summarises certain recognised weaknesses and potential actions to address them:

3.1 Connections between collaborative frameworks and project collaboration

The National Highways A14 case study (Section 4.f) describes the challenges that were dealt with through leadership and commitment by a collaborative team working on a major highway project. It raises the question of whether the team could have benefitted more from systems and relationships that were or could have been set out in the overarching framework under which they had been selected. It also raises the question of how the parties fed back their experience in order to inform improved practices on other projects forming part of that framework.

3.2 Management of collaborative frameworks

The Crown Commercial Service framework alliances case study (Section 4.j) and the Southern Construction Framework local government case study (Section 4.i) describe challenges in managing a collaborative framework, including the need for clear collaborative relationships and systems. They note, for example, the need for contractual clarity in the pursuit of improved value through the work of focus groups, in the connections between different collaborative frameworks and in the development of strategic relationships with tier 2 and 3 supply chain members.

¹¹ *Constructing the Gold Standard*, pp.4 and 17.

3.3 Limitations of pain/gain share incentives

The National Highways A14 case study (Section 4.f) describes how reliance on the NEC Option C pain/gain share incentive was not sufficient to motivate collaborative resolution of serious problems. It shows how these problems were addressed instead by client leadership, by creation of a new collaborative decision-making system and incentive scheme, and by the negotiation of significant changes to the management of risk under the NEC contract. This raises the question of whether it would be more beneficial to capture, in an overarching collaborative framework contract, the required commitments between clients, contractors, designers and framework managers to adopt innovative approaches to joint risk management.

3.4 Tier 1 and 2 early supply chain involvement

The National Highways A14 case study (Section 4.f) acknowledges that new collaborative systems were not extended to include tier 2 and 3 supply chain members, which raises the question of when and how to engage with tier 2 and 3 supply chain members for more effective early supply chain involvement.

The Ministry of Justice HMP Berwyn case study (Section 4.c) describes the importance of the team following the PPC2000 early supply chain involvement contractual procedures to ensure the successful early appointment and integration of tier 2 supply chain members, in order to gain their early feedback and to capture their agreed contributions to project efficiencies.

3.5 Integration through BIM

The National Highways A14 case study (Section 4.f) acknowledges the need for more work on the procurement systems for future projects in order to ensure that teams gain the full benefits of integrated collaborative procurement between designers and contractors using BIM.

The Ministry of Justice HMP Berwyn case study (Section 4.c) describes how BIM was used to integrate the work of design consultants with the work of the tier 1 contractor and tier 2 supply chain members.

3.6 Risk management and joint decision-making

The Central Bedfordshire Council asset management case study (Section 4.h) describes the importance of an early warning system linked to a collaborative contractual

decision-making system, in order to enable an agile collaborative response when seeking solutions that can mitigate the effects of unexpected events.

3.7 Risk management and open-book pricing

The Central Bedfordshire Council asset management case study (Section 4.h) describes the value of an open book pricing system that is fully understood by all parties, so that they are able to assess and agree transparently the cost consequences of their collaborative risk management decisions.

3.8 Challenges in open book pricing

The Southern Construction Framework local government case study (Section 4.i) describes the need for a detailed understanding of open book costing, for example in relation to the risks of selecting team members on the basis of the lowest fees, overheads and profit. This is a cause for concern firstly because it can distort an apparently balanced evaluation process using cost and quality criteria, and secondly because it can disguise the recovery of additional profit which is hidden in the costing of supply chain packages, and can be combined with non-collaborative treatment of tier 2 supply chain members by tier 1 contractors.

3.9 Challenges in strategic supply chain management

The Southern Construction Framework local government case study (Section 4.i) describes the challenge for clients and framework providers in organising and leading the participation of subcontractors and suppliers in collaborative procurement at a strategic level and at a project level. This challenge is exacerbated where framework contracts do not state a detailed process by which tier 1 contractors agree to lead these activities.

3.10 Importance of a contractual BIM integrator

The Liscate School case study (Section 4.g) describes how a contractual BIM integrator can add value by filling the contractual vacuum that otherwise exists when a client and team need to agree mutual intellectual property licences, a shared timetable of BIM contributions, a decision-making forum for improved value proposals and an integrated approach to BIM risk management.

4 Experience from case studies

In addition to exploring potential weaknesses in collaborative approaches, the research team examined a range of case studies in order to harvest evidence of good and bad experiences. The research team examined case studies (a) to (l) below expressly for the purposes of this White Paper. They also examined case studies (m) to (r) below for the purposes of this White Paper and for the purposes of their work on Constructing the Gold Standard. Additional case studies are referred to in other sections of this White Paper, including housing sector case studies in Section 9 that illustrate the benefits of collaborative procurement to housing safety.

These case studies are referred to below and are quoted in subsequent sections of this White Paper. The evidence from these case studies illustrates show collaborative procurement models, integrated contracts and BIM can incentivise efficient project delivery and can optimize whole-life outcomes.

(a) Ministry of Justice framework alliances

The Ministry of Justice established multi-party consultant and contractor framework alliances which achieved reported savings of £42 million through:

- *‘Solid governance structure through a Strategic Core Group comprising representatives from the Ministry of Justice and the Alliance suppliers’*
- *‘Standardised suite of processes and contract templates... used to ensure consistency and ease of use’*
- *‘Early engagement of the supply chain... encouraged by the two-stage approach’.*

The savings comprised *‘Reduced operating costs estimated at £10 million, reduced burden on industry tendering of around £30 million and procurement risk mitigation of about £2 million’*¹².

These Ministry of Justice framework alliance contracts led to post-contract agreed savings of between 20% and 26% plus a range of other improved value as illustrated in case studies 4 (b), 4(c) and 4 (d).

¹²*Effectiveness of Frameworks*, 2012, pp.82- 115, Government Construction Strategy Final Report to Government by the Procurement/Lean Client Task Group <file:///C:/Users/K1217231/AppData/Local/Temp/Procurement-and-Lean-Client-Group-Final-Report-v2.pdf>

(b) Ministry of Justice HMP Cookham Wood

The Ministry of Justice are an experienced and successful collaborative client and BIM user. On HMP Cookham Wood, the Ministry used the PPC2000 contract to implement a collaborative procurement and contractual strategy, forming part of a wider multi-project framework alliance¹³. They created ways in which early supply chain involvement, multi-party relationships and BIM could support more efficient team working and could benefit construction and operational needs. This case study shows how strategic alliancing and joint project planning can optimize the integration of tier 1 and tier 2 inputs to design, cost, time and risk management.

Early supply chain involvement commenced when Interserve worked with its preferred subcontractors to develop innovative proposals at the point of selection by MoJ. This collaboration continued among Interserve and its subcontractors who worked with MoJ and its consultants as an integrated team to undertake agreed preconstruction phase surveys, design development, risk management, cost reviews, enabling works and other preconstruction activities that delivered further innovations.

(c) Ministry of Justice HMP Berwyn

The Ministry of Justice and its team delivered a collaborative project using BIM and modern methods of construction at HMP Berwyn¹⁴. They used BIM, collaboration and early supply chain involvement to focus on local contractors and suppliers, and recognised the need to support the local community. The team at HMP Berwyn recognised and tackled the challenges of:

- How to create and sustain collaborative relationships on a high value, complex project over lengthy preconstruction and construction phases
- How to manage costs in a rising market
- How to optimise the integration of tier 1 and tier 2 input to design, cost, time and risk management
- How to support local businesses and employment in a deprived area

¹³*Cookham Wood Trial Project case study*

[file:///C:/Users/K1217231/AppData/Local/Temp/Cookham Wood case study CE format 130614.pdf](file:///C:/Users/K1217231/AppData/Local/Temp/Cookham%20Wood%20case%20study%20CE%20format%20130614.pdf) and *Constructing the Gold Standard*, p.120.

¹⁴*North Wales Prison Trial Project case study* file:///C:/Users/K1217231/AppData/Local/Temp/Trial-Projects-North-Wales-Prison-Case-Study_Final.pdf and *Constructing the Gold Standard*, p.120.

- How to create improved economic, social and environmental value
- How to learn from other Ministry of Justice projects
- How to manage risks arising from changes and unforeseen events on site.

The Ministry of Justice team reported how:

- They appointed Lendlease using their Strategic Alliance Agreement and used the ‘*Two Stage Open Book*’¹⁵ under a PPC2000 contract to unlock collaborative design, supply chain input, risk management and cost control techniques in a rising market which helped to change relationships with the entire supply chain
- They invited all tenderers to participate in collaborative workshops throughout the mini-competition bid process
- They co-located with Lendlease’s construction team ~~co-located~~ and the consultant team in Solihull for 38 weeks, in order to seek improved value and reduced risks and to cement an aligned one-team approach
- The team followed the PPC2000 contractual procedures for integrating the tier 1 and primary tier 2 supply chain members, gaining their early feedback and capturing agreed contributions to create project efficiencies
- Joint risk management enabled issues to be anticipated early and swift decisions to be made by unanimous agreement of a ‘*Core Group*’¹⁶ for the good of the project
- Early contractor involvement was extended to local and regional tier 2 SMEs, creating new opportunities for local business and jobs
- The team agreed collaborative solutions to manage the risk of a delayed start on site by resequencing and shortening the construction programme, to manage a shortage of precast by using multiple suppliers, to manage the costs of asbestos removal by treating it onsite, and to support on site change management by Core Group interventions where necessary.

¹⁵ *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration*, <https://www.gov.uk/government/publications/two-stage-open-book>.

¹⁶ As provided for in the PPC2000, FAC-1 and TAC-1 contract forms, Association of Consultant Architects 2000, 2016, 2016.

(d) Ministry of Justice HMP Wellingborough

Ministry of Justice led a major collaborative project for a new build resettlement prison in Wellingborough and Kier was awarded a £253m PPC2000 contract. PPC2000 allowed all parties to engage during the preconstruction period and to create a problem-solving culture. The team product innovation and a pioneering approach to offsite manufacture and digital technologies to inform on-site delivery and to create the blueprint for the Ministry of Justice's subsequent 10,000 prison places programme.

The Ministry's aims were to reform and modernise the prison estate to make it more efficient (70% increased energy efficiency compared to a Victorian prison), safer and to focus on supporting rehabilitation (WIFI in every cell enabling in-cell learning). Kier acted as an integrator who brought all the parties together and used digital tools to achieve this objective. Training meetings enhanced collaboration and set the common goals for the project.

Digital tools facilitated the agreement and integration of different design options, delivering beyond BIM level 2 and integrating digital management of costs and clashes. A new standard process cycle was defined to feed information from the design phase through to operation and maintenance. All parties contributed to the information models. Digital tools saved £7million in remedial work.

An online platform assured quality in managing data and in controlling the production of offsite components. This approach improved standardization of components and buildability of assets. Digital tools were also used to test the assumptions of the supply chain during preconstruction.

(e) Surrey County Council Highways

Surrey County Council created a long-term alliance with main contractor Kier and supply chain members Aggregate Industries and Marshall Surfacing, achieving substantial savings, improved quality, a range of social value and an integrated team culture in the delivery of capital highways repairs and improvement works across Surrey¹⁷. Kier, with support from Surrey County Council, ran an agreed process to select subcontractors and suppliers and to create an integrated team for a five year

¹⁷See also *Project Horizon Trial Project case study* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325947/Project_Horizon_Surrey_Trial_Projects_Case_Study_130614.pdf and *Constructing the Gold Standard*, p.123.

£100m programme of capital highways and repair works. This enabled early collaboration with the selected tier 2 and tier 3 supply chain members so as to maximise savings, added value and joint identification of opportunities, including longer-term, larger-scale opportunities in return for savings and added value committed by supply chain members.

Two Stage Open Book and ‘*Supply Chain Collaboration*’¹⁸ enabled a culture of collaborative working at all levels of the supply chain as well as the creation of integrated project teams with better defined roles for individuals employed by the client, main contractor and other supply chain members. In addition to a TPC2005¹⁹ collaborative term contract, the parties entered into a four-way ‘*Alliance Agreement*’ to establish supplementary arrangements for joint working.

Surrey had already achieved savings of 16% at the point of selecting Kier in 2011, against the prices previously paid for comparable works. Implementation of Two Stage Open Book and Supply Chain Collaboration pursuant to alliance processes led to additional agreed savings in excess of 12% that were sustained over a period of five years. It also enabled agreement of 10 -year warranties, new apprenticeships, joint risk management and reduced carbon emissions by creation of a new recycling plant.

Analysis of work on site showed no major remedial work required, no major health and safety incidents and additional improvements to drainage systems and footways as part of the agreed design solutions. Surrey received over 100 complimentary letters received from residents and Council members, having never received any before.

(f) National Highways A14

National Highways (‘*N.H.*’) and its team delivered the high-profile collaborative A14 project. N.H. and joint venture Contractors Costain, Skanska and Balfour Beatty identified problems that led to a rethink of the A14 commercial model and the agreement of new contractual systems, including innovative approaches to collaborative decision-making and sharing project risks. The sequence of events was as follows:

- N.H. used an NEC3 Option C and amendments to create a contract awarded under their Collaborative Delivery Framework

¹⁸ *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration; Constructing the Gold Standard*, pp.131-133.

¹⁹ TPC 2005 Term Partnering Contract, Association of Consultant Architects.

- Significant governance issues and failure by all parties to understand each other's commercial and risk positions led to the need to negotiate and agree a revised commercial model for improved integrated working between the Client and Contractors, plus investment in collaborative training for all parties
- Heads of Terms were agreed, and a subsequent Deed of Variation to the NEC contract, and KPIs were re-aligned with N.H.'s three imperatives of safety, customer & delivery
- Section 6 (Change) of the NEC3 contract was deleted in its entirety and all risks were treated as Project Risks, with no Client or Contractor Risks – the team moved away from who caused a problem to focus instead on who was best placed to solve the problem
- Decision-making was placed with the Integrated Delivery Board and commitments were supported by a Performance Incentives Fund
- All energy was focussed on safely reducing costs without reducing quality, as incentivised by the KPIs
- Open sharing of detailed cost information between the Contractors and Client created one source of truth
- Safety, technical and commercial matters were all openly discussed, and solutions were collaboratively agreed and approved at monthly Integrated Delivery Board meetings.

N.H. reported the following weaknesses, solutions and future improvement plans:

- A rethink of the A14 collaborative commercial model, and the agreement of new collaborative contractual systems, were necessary to save the project from serious problems
- These problems arose despite the original agreed NEC3 Option C collaborative approach, which was substantially changed as part of the agreed solutions
- It was noted by N.H. that information sharing and joint working between the Contractors and Designers needs further improvement, including through better use of BIM
- It was recognised by N.H. that there is a need to bring key tier 2 sub-contractors and suppliers into a new integrated model in order to share in collective aims.
- It was recognised by N.H. that there is a need for further investment in training – especially regarding behaviours and collaborative thinking
- It was recognised by N.H. that there is a need for strong leadership to ensure buy-in at all levels

- It was noted by N.H. that lessons learnt are already being adopted on other N.H. schemes.

(g) Liscate School

Liscate Municipality in Milan used the FAC-1 framework alliance contract²⁰ as a collaborative integrated BIM information protocol for the construction of a high school in Milan, in order to enable a deeper synergy between the client, the designers, the main contractor and the supply chain.

The client and team were concerned as to potential weaknesses arising from risks relating to:

- The adoption of BIM and the challenge of ensuring that all team members understood their roles and relationships
- Poor integration of BIM contributions in the event of traditional reliance only on unconnected two-party contracts
- Missed opportunities due to excluding subcontractors from design development and risk management
- Delays and additional costs caused by failure to minimise the impact of unforeseen events.

The purposes of using FAC-1, its multi-party structure and its collaborative processes were explained to all team members, including prospective contractors as part of the tendering process. The team reported how FAC-1 was used for the following purposes (the words in italics are defined in FAC-1):

- To link workflows and to create direct mutual intellectual property rights
- To establish digital project controls, setting out not only agreed *Objectives* and *Success Measures* but also the computational codes for achieving the required results, the accountable team members for each of the agreed *Objectives* and *Success Measures*, and the joint systems for performance measurement
- To agree and implement joint *Risk Management* actions so as to maintain alignment of commercial interests and encourage proposals by which team members could deal with risk issues and still achieve their pre-defined *Targets*

²⁰ FAC-1 Framework Alliance Contract: <https://allianceforms.co.uk/about-fac-1/>.

- To manage BIM processes and avoid cost overruns and delays
- To establish and support the role of an FAC-1 *Independent Adviser*, who was an officer of the *Client* and who was also appointed as *BIM* consultant and coordinator
- To agree and support *Alliance Activities* that included data sharing, BIM model management and maximum involvement of subcontractors and suppliers through *Supply Chain Collaboration*
- To reduce BIM clashes, using the FAC-1 multi-party structure to enable integration of BIM models and efficient information delivery
- To set out guidelines set out in the *Framework Documents* that were accepted by all the team members, defining how to use the CDE platform for managing workflows and sharing information and how to specify the required information for built models
- To develop and agree the *Improved Value* proposals submitted by different *Alliance Members*, including proposals to reduce whole life cycle costs.

(h) Central Bedfordshire Council asset management

Central Bedfordshire Council (CBC) used its TAC-1²¹ asset management alliance to work with ENGIE and Savills in managing the risks arising from Covid-19. CBC made clear to their officers and team members the value of collaborative practices and shared cost information. These were crucial when agreeing the actions that were required to mitigate the impact of Covid-19.

The team used TAC-1 contractual joint *Risk Management* systems (words in italics are defined in TAC-1), met the challenges that alliance members faced in sustaining a collaborative approach during the pandemic, and adopted the proposals for increased collaboration set out in the CLC Roadmap to Recovery:

- *Alliance Members* agreed the *Alliance Manager* (appointed by the *Client*) would assume management responsibility for both CBC and Engie and would work for the best interests of the *Alliance*, for example in order to assist understanding and implementation of open book costing and of other agreed collaborative approaches

²¹ TAC-1 Term Alliance Contract: <https://allianceforms.co.uk/about-tac-1/>

- When Covid 19 struck, the *Alliance Members* showed a strong understanding of their collaborative commitments and acted in accordance with the agreed collaborative processes
- At the start of lockdown, the *Alliance* agreed not to furlough any staff, in response to the Construction Leadership Council release PPN 02/20 and in order to preserve the resilience of the services
- The *Alliance* responded to Covid-19 using the TAC-1 contractual *Early Warning* mechanism, which allowed the *Core Group* to take an agile approach even when faced with a pandemic, and to highlight and address specific potential problems before they became disputes
- The *Core Group* agreed ways to keep stakeholders and customers informed of the quickly changing service arrangements
- Risk assessments were used to keep the situation under control and to support the *Alliance* communications plan
- The *Alliance* agreed to focus on emergency repairs and external works wherever residents were not displaying Covid-19 symptoms and not shielding, and to arrange through the *Alliance* for *Specialists* to enter properties where residents were shielding or displaying symptoms.

(i) Southern Construction Framework local government projects

Southern Construction Framework(‘SCF’) procured a range of collaborative local government projects using ECI with BIM under the Two Stage Open Book approach to project call-off. SCF illustrated how client users of their collaborative frameworks improved value by developing and agreeing reliable design, cost, time and risk management information. They also identified the challenges in managing sustainable tier 1 contractor margins and the need to improve subcontractor collaboration by developing shared tier 2 supply chains, long-term supply chain commitments and the wider use of BIM. The following relevant issues were noted:

- Two Stage Open Book frameworks enabled rapid and efficient tier 1 contractor procurement, integrated design and procurement, quality assurance and performance management, open book costing and risk allocation, collaborative planning and cost certainty prior to construction
- Client managers identified potential lost advantages from not incorporating BIM into strategic planning and project call-off, for example in respect of FM and other project operation

- SCF are addressing how to ensure that its future framework standards and client guidance enable collaborative teams to incorporate BIM into the operational phase of the building life cycle
- Even in a balanced approach to open book cost and quality criteria, there is the risk of low bidding on fees, overheads and profits and of additional profit being hidden in works package costs combined with non-collaborative treatment of tier 2 supply chain members by tier 1 contractors
- Mini-competitions and the two-stage build-up of package costs need to be carefully managed, and the risks fully identified, so as to ensure transparency, involving the supply chain directly so as to mitigate the risks of distorted cost modelling and non-collaborative supply chain management
- SCF wants to do more collaborative work with subcontractors and suppliers, noting that 85% of SCF spend is with SME's, and 60% is local to the site area
- The benefits of long-term supplier relationships are mutual confidence, reliable outcomes, continuous improvement and custodianship, but SCF recognised that clear systems and commitments are required at framework level to drive progress and to underpin the interfaces between SCF, tier 1 contractors and prospective tier 2 subcontractors and suppliers.

(j) Crown Commercial Service framework alliances²²

Crown Commercial Service reported on their procurement consultant frameworks with a total value of £2.8 billion covering multi-disciplinary project management and full design services. In addition to each supplier signing a two-party bespoke framework contract, CCS led the creation and management of a multi-party alliance contract through which the appointed suppliers worked together in finding ways to deliver better value services to Government clients. Crown Commercial Service entered into an FAC-1 framework alliance framework with Aecom, AHR Architects, AMEC Foster Wheeler Environmental and Infrastructure, Arcadis, Capita, Faithful & Gould, Gleeds, Kier Business Services, Mace, McBains, Mott McDonald, Ridge, Turner & Townsend and WYG. The agreed objectives were to deliver improved value for framework clients by:

- Sharing and monitoring best practice intelligence
- Sharing and monitoring learning between projects and programmes of work
- Establishing, agreeing and monitoring consistent and more efficient working practices
- Agreeing and monitoring techniques for better team integration
- Agreeing and monitoring improved procurement and delivery systems on projects and programmes of work

²² See also Constructing the Gold Standard, p. 32 , Annex 2 and Annex 3.

- Sharing and monitoring other improvement initiatives created with contractors and other supply chain members.

The consultant alliance members developed shared best practice and consistent approaches to early contractor involvement and BIM. The agreed success measures and targets were:

- Evidence of progress and completion of alliance activities by the alliance core group, by Special Interest Groups and by alliance members, in accordance with the agreed FAC-1 Timetable
- Enhancement of the reputation of the framework
- Additional users of the framework
- Additional work awarded by users of the framework.

Crown Commercial Service (CCS) then created collaborative framework alliances for a wide range of construction and engineering sectors, all based on the FAC-1 framework alliance contract. Each of these alliances establishes the contractual basis for collaborative procurement at all levels of the supply chain and the contractual machinery necessary to underpin the integrated use of BIM. The alliances also encourage the creation of sub-alliances by each client user plus collaborations across the different alliances.

CCS reported on the structure of the FAC-1 collaborative framework alliances created between multiple clients, contractors, consultants and modular providers. CCS created contractual systems through which these framework alliances are designed to seek improved value, reduced risks and more effective use of BIM. By way of summary (words in italics are defined in FAC-1):

- CCS have created collaborative frameworks in multiple Lots to offer a full lifecycle service for property, construction, infrastructure and consultancy projects
- Each Lot forms a separate FAC-1 Alliance, and establishes a collaborative approach to the specific Objectives, Targets and Success Factors particular to that market sector
- Client users become a member of one or more of the Lot Alliances
- Extensive market engagement was used to develop Alliance collaboration methodologies and incentivisation
- CCS and its suppliers and clients entered into multi-party FAC-1 contracts, which set out award procedures for each project or programme of work, with a set of integrated relationships through which Client users and suppliers can all learn from each other's experiences

- CCS offer the option of an FAC-1 ‘Sub-Alliance’, and gave the example of the Ministry of Justice 10,000 place New Prisons Programme:
 - where four successful contractors will develop template design and programme management
 - where critical suppliers will join the Sub -Alliance
 - where there is an option for designers and FM operators also to join the Sub-Alliance.

CCS are using the following approaches to address potential areas of weakness:

- Investing in the professional management of their multi-lot framework alliances, including focus groups that support development of innovation, improvement and shared good practices
- Linking the focus groups to agreed deadlines and interfaces for agreed actions, set out in the FAC-1 Timetable and monitored by the Alliance Manager
- Providing dedicated support focussed on the range of project types and sectors in which they operate, including an online ‘Knowledge Hub’ for exchanges of best practice
- Workshops and guidance for their clients and suppliers in relation to the relationships, commitments and opportunities created by the CCS that show how the different framework alliances operate as an ‘eco-system’, with cross-alliance working initiatives that integrates the different framework alliances created with consultants, contractors and modular suppliers
- Using the Ministry of Justice New Prisons Programme in order to illustrate to other CCS users the improved collaborative opportunities that can be created through a client-led Sub-Alliance.

(k) Oxfordshire County Council Highways

Oxfordshire County Council (OCC) and Skanska entered a £40 million per annum term maintenance contract for routine maintenance activities, as well as capital renewals and the delivery of new infrastructure. The original term maintenance contract was awarded to Atkins on 13 Jul 2010 (subsequently acquired by Skanska on 4 October 2013). The contract was for 10 years from 1 April 2010, with up to a further 10 years' worth of potential extension linked to performance.

Whilst both parties considered the partnership was performing well, they agreed there were opportunities to deliver improvements by further developing their alliance and longer-term planning, with a focus on delivering improved outcomes on a number of

OCC priorities. In late 2019 OCC and Skanska committed to work together to identify these opportunities, with joint project teams tasked with developing proposals for specific elements of the improvement programme.

The parties agreed to use FAC-1 to sit as an umbrella legal commitment to encompass the savings and other benefits identified, to tie in new procedures developed to make the new changes work, and to ensure that opportunities to capture improved value are formally agreed. This agreement was to be finalised before an extension to the underlying NEC is agreed and would cover the last three years of the contract if extended. The contract extension, including the improvement plan and the use of FAC-1, was formally approved by Oxfordshire's Cabinet in April 2021.

In spite of the challenges to the partnership of having to undertake this work whilst still continuing to deliver essential services during Covid 19, the project teams were able to identify a number of significant opportunities, including:

- Greater programme certainty and collaborative works planning
- Different methods of construction and materials
- Refinements to process and ways of working
- Carbon consumption reductions
- Skills and Training enhancements.

OCC reported they expect initial benefits achieved as part of the FAC-1 Framework Alliance Contract will include financial savings to the council of minimum £250k per annum over the 3-year period of the FAC-1 alliance. OCC also reported that they expect further savings and other benefits to be delivered over the life the FAC-1 contract.

Strategic collaborative decisions processes included:

- Joint exercises across Skanska, their supply chain and OCC
- A series of workshops to identify opportunities to combine different work streams and routine operations across geographies and year of delivery
- Maximising programme efficiency to drive down cost
- Regular reviews throughout the year.

Strategic Net Zero Carbon decision-making processes included:

- A joint OCC/Skanska workshop held in Oct 2019 to look at initiatives to support OCC and Skanska's carbon neutral targets
- Key highlights of this workshop included:
 - A suite of low carbon design solutions and associated Action Plans

- Development of a Partnership Carbon Reduction Strategy and associated Action Plan Creation of Whole Life Cost & Carbon tool
- Focused training on lower carbon alternative materials
- Trials of new lower carbon materials
- Calculating carbon baselines for schemes to identify ‘Hotspots’.

(l) SCMG housing alliance

Hackney Homes and Homes for Haringey (together ‘SCMG’) established a £200 million multi-party housing framework alliance which achieved post-tender savings averaging 14% plus:

- *“Reduced risks, costs savings and time savings through accelerated constructor/supply chain briefing”*
- *“Subcontractor/supplier innovations in proposed new materials and specifications” and exchange of best practice between specialist competitors”*
- *“Improved repair and maintenance” and “more sustainable solution”*
- *“Development of opportunities for local tier 2/3 sub-contractors and suppliers ... across 30 different disciplines”*
- *“Additional employment and skills opportunities”*
- Lower bid costs for other Alliance Members, *“specifically £719 per million of turnover (under SCMG) as against £4,808 per million of turnover (under the comparable traditional bid)”*²³

(m) Anglian Water @one Alliance: Construction Playbook case study

Anglian Water’s programme²⁴ is defined in five-year Asset Management Periods (AMPs), typically investing £4.5bn in each AMP, covering replacement and refurbishment of above and below ground assets. Historically, projects were delivered in a largely transactional manner with Anglian tendering works and selecting the most economically advantageous proposal. AMP 3, whilst successfully delivering the required outputs through a partnering approach, was felt to be less effective than it could have been. With AMP4 requiring a further focus on efficiency, effective solutions

²³ SCMG Trial Project case study <https://www.gov.uk/government/publications/procurement-trial-case-study-social-housing-refurbishment>.

²⁴ Constructing the Gold Standard Annex 3; sourcing.programme@cabinetoffice.gov.uk; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/359853/Alliancing_Best_Practice.pdf; <http://www.constructionleadershipcouncil.co.uk/news/procuring-for-value/>

and customer service, Anglian Water decided to shift to a different delivery model, developing both its capability as an asset owner and more effective relationships with its partners.

A review of best practice across different sectors and an identification of the underpinning best practice characteristics led to Anglian adopting a strategy based on more integrated and collaborative working and the development of long-term supply chain relationships.

These relationships were aligned directly with Anglian Water's customer outcomes, which had already been defined through a process of engagement and consultation with customers. Partners were selected against their capability to deliver these outcomes and incentivised to deliver improvements against historic baseline performance. Anglian and the main partners were brought together in an alliance. This alliance, as an integrated and collaborative organisation, was engaged at outcome level, not at project or scope, giving partners and the wider supply chain the opportunity to develop more innovative solutions and to challenge standards.

The alliance team is the integrator, developing strategies for how the programme should be delivered and driving improvement initiatives. The partners that make up the alliance, along with Anglian Water, are shareholders that generate a return by outperforming historic benchmarks for delivery of outcomes.

All parts of the alliance work collaboratively, taking a best for task approach to the development of integrated teams. The alliance manages the wider supply chain, with a longer-term framework used to develop more effective relationships and secure earlier involvement of the right suppliers. As with the main integrator, framework suppliers generate a return by delivering value against historic baselines, not by delivering work or providing hours.

An example of the alliance acting as integrator was in the development of product-based delivery. The alliance was able to shift from the historic project approach, recognising the opportunity to translate repeatability within the programme into standard products and components and to use a 'product catalogue' as the starting point for delivering the programme. This created significant value when compared to a previous approach that amplified variance and redesign at all levels, including unique project-led solutions and multiple variations of critical components.

This was allied with a digital transformation strategy which has seen the alliance design and build everything virtually, including rehearsing and optimising construction in virtual rehearsal suites before going to site. Not only has this shifted delivery from construction to assembly but it has also provided health and safety benefits through off site construction of products. Digital transformation has also led to more effective engagement with users and operators, with greater involvement in the virtual development of solutions improving operability and operator buy-in. The progress of

digital rehearsal demonstrates the value in delivering through integrated teams, where all the influential parts of the wider supply chain are involved in optioneering and solution development.

(n) Connect Plus DBFO: Trial Project collaborative framework

Connect Plus²⁵ created integrated teams under a collaborative framework to deliver a £350 million highways asset management programme using Two Stage Open Book within the 30-year concession. The teams comprised Connect Plus (M25) and National Highways (clients), Jackson Civil Engineering, Aggregate Industries, Lafarge Tarmac, Balfour Beatty, (Geoffrey) Osborne, Skanska UK (main contractors), Atkins Consultancy Services, Flint & Neill, Parsons Brinckerhoff, Connect Plus Services (lead designers and contract managers) and Temporal Consulting (collaborative change consultant).

Connect Plus created and implemented an innovative Sustainable Business Culture Model through which it agreed efficiency savings of 8% together with design improvements to reduce whole life costs and improve long-term reliability. The culture promoted continuous improvement dialogues, including a collaborative cost review, ensuring that good practice was repeated and that lessons were learnt and applied to subsequent projects.

Connect Plus established a Balanced Scorecard process to allow the whole supply chain to input into monitoring performance across the Connect Plus community. The supply chain members were regularly invited to score performance against these objectives by reference to critical success factors. Scores were given on a 1 to 12 scale, allowing the whole M25 community to give feedback on the programme, understand areas of strength and improve areas of weakness.

The Balanced Scorecard approach enabled Connect Plus to understand and measure progress towards its declared objectives of:

- Creating and maintaining a group of directors and facilitators empowered with the skills and behaviours to support and lead the cultural change and role model collaboration
- Delivering a whole life approach
- Minimising the impact of maintenance works
- Maintaining project facilities
- Enhancing knowledge of project facilities
- Respect for the environment

²⁵ Constructing the Gold Standard Annex 3; <https://constructingexcellence.org.uk/case-study-connect-plus-highways-m25-england-sustainable-business-culture-model-two-stage-open-book/>

- Reduced risk.

(o) Department for Work and Pensions: Job Centre Plus framework alliance

A fast-track programme of office adaptations was undertaken through a framework alliance set up jointly by Department for Work and Pensions (DWP) and Land Securities Trillium (LST)²⁶, using standard designs, materials and equipment adapted to a wide variety of different buildings. The objective was to create an efficient contract structure to enable a quick start on site, utilising model processes and contract documents to streamline a nationwide programme.

The framework programme subdivided England, Wales and Scotland into multiple districts, and a supplier was appointed to undertake works in each district. DWP and LST wanted to ensure cross-pollination between districts, and this was achieved through a single multi-party framework alliance contract entered into between all 14 contractors and the joint clients. DWP and LST also wanted to create a fully integrated supply chain to support the roll- out programme, and specialist framework agreements were negotiated in parallel with key subcontractors and suppliers.

Strict timetables were agreed to govern both the preconstruction and construction phases of each project. The framework alliance used cost reimbursement combined with incentives that linked cost savings to the future award of work, and the final cost was £737million against a forecast of £981million, achieving savings of 24.8%.

(p) Scape Framework: Archbishop Beck School Trial Project

The Archbishop Beck Sports College Trial Project²⁷ had a value £15.9 million (pre-savings) and comprised the construction of a new build school by Liverpool City Council, Willmott Dixon Construction, Sheppard Robson, and key supply chain members Mouchel (structural, mechanical & electrical), D Morgan (groundworks), A&B (M&E specialist works) and Cara & Metsec (steel frame).

The Council selected Willmott Dixon through the Scape Framework, seeking to improve on timescales achieved by the same team on the Notre Dame School project, and prioritised engagement of local businesses and local employment and training opportunities. The project achieved 60% local spend compared to 50% on Notre Dame.

²⁶ Constructing the Gold Standard Annex 3; <http://www.ebuildingcontracts.co.uk/wp-content/uploads/2017/09/10-Year-Anniversary-PPC-and-5-Year-TPC.pdf>

²⁷ Constructing the Gold Standard Annex 3; <https://www.gov.uk/government/publications/procurement-trial-case-study-archbishop-beck>

Cost savings of 26% were agreed, from a rate of £1,950 per square metre for a comparable project to a rate of £1,438 per square metre, through:

- Lessons learned from the Notre Dame School project
- Innovations through ESI with Willmott Dixon and tier 2/3 supply chain members.

(q) Property Services Cluster: Trial Project Framework

Hampshire County Council, Surrey County Council, Reading Borough Council and West Sussex County Council created a multi-client schools framework alliance²⁸ with a total value of £119 million. The contractor partners Osborne, Miller and Mansell were jointly appointed through a mini-competition and formed a Cluster Delivery Team (CDT) which collaborated to share resources, information and supply chains. The team aimed to establish common designs, elements and components and, subsequently, common supply chains.

All contractors jointly engaged with existing and potential tier 2 and tier 3 subcontractor and supplier partners to identify the pipeline of opportunities available, allowing those subcontractors and suppliers to contribute to cost efficiencies and provide added value through early engagement. The team agreed efficiency savings of 7% and additional benefits that included:

- Effective engagement of the tier 1-3 supply chains members by and through the CDT
- Greater and more accurate market intelligence through sharing knowledge (cost trend data and avoiding supply chain overload)
- High levels of stakeholder satisfaction across the programme
- Delivering opportunities for skills training and new apprenticeships.

(r) Environment Agency Collaborative Framework: Rye Harbour Trial Project case study

The Rye Harbour Trial Project²⁹ comprised the £9.6 million replacement of a harbour wall by a team comprising Waterways / Environment Agency (client), Jackson Civil Engineering (main contractor), Halcrow, EC Harris (project manager), Arcadis (cost

²⁸Constructing the Gold Standard Annex 3; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325955/Property_Services_Cluster_-_Case_Study_CE_format_120614.pdf

²⁹ Constructing the Gold Standard Annex 3; <https://www.gov.uk/government/publications/procurement-trial-case-study-rye-harbour>; <https://constructingexcellence.org.uk/case-study-environmental-agency-next-generation-supplier-arrangements-collaborative-delivery-framework/>

consultant), Arcelor Mittal (steel sheet pile supplier), Team Van Oord in partnership with Jackson's (civil engineering) and Commercial Marine and Piling (subcontractor). The project involved the replacement of a failing structure / steel sheet pile retaining wall as part of the Environment Agency's flood defence programme. The Environment Agency adopted Cost Led Procurement pursuant to their existing framework which enabled them to generate savings of 6% and also to progress from business case to project completion in 14 months.

In order to manage the constraints of a tight timeframe combined with protection orders on the site and working on a live harbour, the client, consultants, contractor and tier 2 and tier 3 supply chain members collaborated to find new solutions which led to:

- Precious intertidal plants from the salt marsh being transplanted, avoiding loss of vegetation
- Natural England accepting the habitat created at Rye Harbour Farm as mitigation for the mudflats lost when the team had to drive approximately 1000m of piling
- Close working with marine ecology teams preventing any lost mudflats from damaging the environment and saving money in waste disposal
- Jackson Civil Engineering and Team van Oord (tier 2) proposing a vibro-piling innovation which reduced noise on site so that birds were not disturbed and so that the team could work through the bird breeding season. This innovation avoided de-mobilisation and remobilisation costs of £117,000 and led to the programme time being reduced.

5 Interactions between procurement, contracts and BIM

5.1 The need for collaborative procurement

McKinsey reported there is an estimated \$10 trillion spent on construction-related goods and services every year, yet the sector's labour productivity growth has averaged only 1% a year over the last two decades, compared with 2.8% growth for the total world economy and 3.6% for manufacturing³⁰. The construction industry is plagued by fragmentation, which is usually associated with:

- Poor cooperation between the client and the supply chain, especially in the early exploratory stages of decision-making and process planning
- Difficulties in recruiting a talented workforce

³⁰ *Reinventing Construction Through a Productivity Revolution*, McKinsey, 2017, <https://www.mckinsey.com/business-functions/operations/our-insights/reinventing-construction-through-a-productivity-revolution>.

- Lack of understanding of the commercial rewards available through new technology
- Insufficient knowledge transferred from project to project
- Limited innovation due to poor collaboration between companies and research teams³¹.

The problems of a fragmented construction sector worsened due to the global downturn in 2008, which distracted clients and the industry from collaborative procurement models towards exploiting lowest price bids in a cut-throat marketplace³². By 2010 the newly-elected UK Coalition Government expressed concerns over artificially low prices which would ultimately lead to:

- Poor quality work by cutting corners
- Delayed payment of subcontractors and suppliers
- Claims and disputes to make up for lost profit
- Increased defaults and insolvencies where unsustainable prices and payment delays become intolerable³³.

As a result, when drafting the 2011 Government Construction Strategy³⁴, the Government's Chief Construction Adviser Paul Morrell proposed the development of more reliable information through early contractor involvement ('*ECI*'), collaborative working and the use of BIM as new cornerstones for more efficient procurement and delivery of construction, engineering and asset management. The 2011 Strategy recommended that these approaches should be incorporated into new procurement models, tested through a programme of '*Trial Projects*'³⁵ which provided compelling supporting evidence.

Reports underlining the need for improved procurement and contracting practices include:

- The 2016 Farmer report '*Modernise or Die*'³⁶

³¹ *Reinventing Construction Through a Productivity Revolution*

³² UK clients drawn back to single-stage lowest price tendering because it appeared to apply '*commercial pressure to secure cost reduction*', Rawlinson, S (2008), "*Procurement: Single Stage tendering*" Building magazine 46: pp.68-69

³³ The same concerns, arising after an earlier recession, emerged in Latham, M., 1994, <https://constructingexcellence.org.uk/wp-content/uploads/2014/10/Constructing-the-team-The-Latham-Report.pdf>

³⁴ <https://www.gov.uk/government/publications/government-construction-strategy>

³⁵ *Government Construction Trial Projects*, 2012, <https://www.gov.uk/government/publications/government-construction-strategy-trial-projects>

³⁶ *Modernise or Die, Time to decide the industry's future*, Farmer, M. (2016). <file:///C:/Users/K1217231/AppData/Local/Temp/Farmer-Review.pdf>

- The 2017 McKinsey report ‘*Reinventing Construction Through a Productivity Revolution*’³⁷
- ‘*Building a Safer Future*’, the 2018 Hackitt Review of Building Regulations and Fire Safety³⁸
- The 2018 Housing Forum report ‘*Stopping building failures, how a collaborative approach can improve quality and workmanship*’³⁹
- The 2018 Construction Leadership Council report ‘*Procuring for Value*’⁴⁰
- The 2020 Deloitte report ‘*Engineering and Construction Industry Outlook*’⁴¹
- The 2020 ‘*Construction Playbook*’ to which the research team contributed⁴².

The UK best practice body Constructing Excellence has championed collaborative procurement for many years. In 2011, it published guidance that included the following three overriding principles:

- ‘*Common vision and leadership: an absolute focus on the end purpose based on a clear understanding by all participants of what represents value for the client and end users. Leadership needs to establish this common vision and then constantly relate progress by the project to this vision to reinforce the team’s goal*’
- ‘*Collaborative culture and behaviours: collaborative behaviours include teamwork and joint problem solving. Participants demonstrate values such as trust, fairness, openness, no-blame, honesty and transparency*’
- ‘*Collaborative processes and tools: adopting processes and tools which support the development of the collaborative culture and deliver the benefits, such as*

³⁷ *Reinventing Construction Through a Productivity Revolution*, p.8.

³⁸ *Building a Safer Future*, Dame Judith Hackitt, 2018, Independent Review of Building Regulations and Fire Safety: Final Report.

file:///C:/Users/K1217231/AppData/Local/Temp/Building_a_Safer_Future_-_web.pdf

³⁹ *Stopping Building Failures*, Housing Forum, 2018, <https://housingforum.org.uk/reports/quality-and-standards/stopping-building-failures/>

⁴⁰ *Procuring for Value*, Construction Leadership Council, 2018, <https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2018/07/RLB-Procuring-for-Value-18-July-.pdf>

⁴¹ *Engineering and Construction Industry Outlook*, Deloitte, 2020, <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-2020-engineering-construction-outlook.pdf>

⁴² *Construction Playbook*, Government Guidance on sourcing and contracting public works projects and programmes, December 2020,

file:///C:/Users/K1217231/AppData/Local/Temp/The_Construction_Playbook.pdf

*information collaboration platforms, open book costing, lean and waste elimination, and project bank accounts*⁴³.

In 2017 McKinsey pointed out that poor productivity in the construction sector requires us to ‘rewire the contractual framework’ and suggested that ‘if construction labour productivity were to catch up with the progress made by other sectors over the past 20 years... we estimate this could increase the construction industry’s value added by \$1.6 trillion a year’.⁴⁴

In the aftermath of the 2017 Grenfell Tower disaster in London, Dame Judith Hackitt emphasised that current procurement systems needed a complete overhaul as ‘the primary motivation is to do things as quickly and cheaply as possible rather than to deliver quality homes which are safe for people to live in’⁴⁵. Dame Judith pointed out that there is a cultural issue associated with a ‘race to the bottom’ and stressed that the reform of current practices should ‘lead to a significant increase in productivity’⁴⁶. She also recognised the fundamental role of BIM in creating and maintaining accurate asset data. Dame Judith’s recommendations are explored in Section 8 of this White Paper.

5.2 The role of balanced evaluation process

A successful collaborative procurement process depends on the quality of the client’s brief, which should set out comprehensive information as to the client’s business needs and all relevant external factors, including:

- The initial goals and objectives of the project, signed off by the client as the definition of the business need to be met
- All project specific requirements and constraints that may be pertinent
- Any time and budgetary constraints.

The Construction Industry Research and Information Association (‘CIRIA’), in its 1998 guidance ‘*Selecting Contractors by Value*’, recognised the need for clients and their advisers to invest time and money in procurement strategies and processes in order:

⁴³ *Constructing Excellence*, 2011, <https://constructingexcellence.org.uk/wp-content/uploads/2015/01/CW-Hymn-Sheet-FIN2.pdf>

⁴⁴ *Reinventing Construction Through a Productivity Revolution*, p.4.

⁴⁵ *Building a Safer Future*, pp. 5,8.

⁴⁶ *Building a Safer Future*, p. 109.

- Thoroughly to work through and prioritise what they are seeking to gain from a project
- To set up projects so as to enable contractors to contribute the maximum value
- To identify relevant criteria for their selection
- To gather information to enable these criteria to be applied.

In order to run a procurement process on the basis of quality as well as price, a client needs to establish a range of criteria that can be assessed objectively. A process of market consultation through informal early market engagement will often reveal important information that influences the client’s approach in framing its criteria for the identification and appointment of designers, contractors and other team members.

The Construction Playbook requires the use of ‘*value-based procurement*’ by which it expects that clients will ‘*consider the outcomes they are trying to achieve and identify wider value drivers beyond speed, cost and quality*’⁴⁷. This work in being taken forward by the Construction Innovation Hub in the development and trialling of their ‘*Value Toolkit*’ which is expected to be complementary to and symbiotic with this guidance.

The Construction Playbook requires that the evaluation of bids is based on a client’s ‘*clear understanding of value, their desired/required outcomes and how these align to government’s wider priorities, including net zero GHG emissions by 2050*’⁴⁸. It recognises that framework providers and clients will need to adopt new evaluation practices in order to achieve this clear understanding and requires that:

- ‘*Value-based procurement should be adopted at an organisational level and driven through a portfolio approach to projects and programmes*’
- ‘*Evaluation – and evaluation criteria- should focus on value over cost*’
- ‘*The quality evaluation criteria need to be sufficiently well developed and detailed to allow for the differentiation in scores between competing bids, to avoid too close or identical scores from bidders*’⁴⁹.

Achieving a realistic and robust balance between cost and quality is essential to the successful selection of project team members. Clients should look beyond only cost comparisons and examine the value-adding proposals of potential team members, such as their project-specific experience and competences, their understanding of the client’s goals and objectives and the whole-life cost impact of their proposals, in order that the client’s investment in the project can be optimised.

⁴⁷ *Construction Playbook*, p. 56

⁴⁸ *Construction Playbook*, p. 56.

⁴⁹ *Construction Playbook*, p. 57.

The Construction Innovation Hub's Value Toolkit focuses on 'Value Definition', an agreed 'Delivery Model' and systems of 'Procuring for Value' and 'Ongoing Measurement'.⁵⁰ The Toolkit recognises that each project or programme has its own unique value profile by reference to the relative importance of four value categories:

- Natural (air, climate, water, land, resource, use, biodiversity)
- Social (influence and consultation, equality and diversity, networks and connections)
- Human (employment, skills and knowledge, health, experience)
- Produced (lifecycle cost, return, production, resilience).

5.3 The role of collaborative contracts

Declarations of collaborative principles can create shared values among team members, but, unless these are translated into collaborative commitments to undertake specific actions, collaborative principles rarely succeed. For example, general declarations are of limited value in dealing with challenges and failings and the parties are usually quick to revert to the protections of their traditional contracts.

Collaborative construction contracts are not a novel concept. They comprise features that were recommended by Sir Michael Latham in 1994:

- A specific duty for all parties to deal fairly with each other, and with their subcontractors, specialists and suppliers, in an atmosphere of mutual cooperation.
- Clearly defined work stages, including milestones or other forms of activity schedule
- Integration of the work of designers and specialists
- A specific and formal partnering agreement' that is '*not limited to a particular project*'
- Partnering arrangements that '*include mutually agreed and measurable targets for productivity improvements*'.⁵¹

The research team examined how published forms of collaborative contract can contribute to the scope for effective collaborative procurement, and to realising the potential of BIM, including collaborative framework contracts that act as umbrellas or

⁵⁰ *Value Toolkit*, 2020, Construction Innovation Hub, https://constructioninnovationhub.org.uk/wp-content/uploads/2020/07/20200715_BR_09_ValueFrameworkReport_Digital_Pages.pdf

⁵¹ *Constructing the Team*, Latham, M. 1994, Sections 4, 5 and 6. <https://constructingexcellence.org.uk/wp-content/uploads/2014/10/Constructing-the-team-The-Latham-Report.pdf>

integrators of the other contracts entered into among team members. For example, the UK ‘*Effectiveness of Frameworks*’ report highlighted the benefits of effective frameworks as vital to the public sector and the construction industry as a whole, stating that “*Evidence suggests that benefits can accrue from the use of effective frameworks in procuring construction and they include:*

- *delivering sustainable efficiency savings*
- *reduction in consultancy and construction costs*
- *delivery of projects closer to target cost and time*
- *reduction of disputes, claims and litigation*
- *high client satisfaction rates*
- *high proportion of work undertaken by small and medium-sized enterprises*
- *high proportion of local labour and sub-contractors*
- *high take-up of government in initiatives such as fair payment, apprenticeships*
- *high proportion of waste diverted from landfill*
- *good health and safety performance against national average*
- *acting as a key enabler to integration of the supply team’*.⁵².

The UK ‘*Effectiveness of Frameworks*’ recognised that ‘*the general lack of standard-form framework arrangements makes it difficult for clients to procure frameworks on a consistent basis*’⁵³, and King’s College London Centre of Construction Law has researched the potential for a standard form of framework alliance contract that could replace bespoke agreements currently in use. It found that:

- Without clear contractual systems the construction industry can lose patience with ideas before they are embedded in working practices, shifting their energy to investigate new fads in preference to the development of innovations that have been proven to work
- If the provisions of framework alliance contracts are not accessible in a way that enables them to be well understood, enthusiasts may rely instead on alluring headlines and symbolic declarations, in the hope that these offer shortcuts that replace more rigorous contractual understanding
- Without standard form alliance contracts, there is the risk that only those clients with sufficient resources and commercial influence to create bespoke alliance

⁵² *Effectiveness of Frameworks*.

⁵³ Department for Digital, Culture, Media & Sport , 2017, <https://www.gov.uk/government/publications/uk-digital-strategy/4-the-wider-economy-helping-every-british-business-become-a-digital-business>

forms are able to adopt collaborative practices, which impedes the sharing of knowledge and the recognition of more widely applicable rules.⁵⁴

Based on successful prototypes and UK Government guidance, plus 12 months' consultation with over 120 clients, consultants, contractors, lawyers and academics across 14 jurisdictions, King's College London Centre of Construction Law drafted the FAC-1 framework alliance contract as a flexible standard multi-party form.⁵⁵ The FAC-1 framework alliance contract is a multi-party umbrella agreement which has the ability to:

- Set out who works on what with whom and at what level of responsibility so that contributions under bilateral contracts can be drawn together more effectively
- Create mechanisms that ensure stronger commitment to shared objectives and collective self-regulation, as well as improved transparency and efficiency, through the ability to share information on mutually agreed terms.

FAC-1 is endorsed by Constructing Excellence, the Construction Industry Council and the Construction Playbook. Uses of FAC-1 are considered in this White Paper as examples of how a contractual instrument can support procurement strategies for incentivizing collaborative delivery to optimize whole-life outcomes. Case studies show how FAC-1 can help to plan and integrate complex projects, projects using BIM and multi-project programmes of work and/or services and/or supplies.

5.4 The importance of whole lifecycle procurement

A collaborative relationship enables the development of knowledge-sharing among the parties involved in a programme of work, building collaborative interfaces and activities which improve measurable environmental, economic and social value. The creation of an integrated team early in the preconstruction phase of a project or work programme enables more productive contributions toward the design, construction and operational phases, involving end-users and interested third parties. It is also beneficial to both the team and the project to involve the supply chain members in these processes at the time when they can add most value through their specialist knowledge. This change in mindset can build relationships that enable reduced costs, improved warranties and other improved value. By involving the supply chain at an early stage,

⁵⁴ *Construction Playbook*, p. 25.

⁵⁵ FAC-1 Framework Alliance Contract and TAC-1 Term Alliance Contract.

it is possible to make constructive decisions that help define more accurate and reliable information for planning, designing, constructing and managing an asset.

Procurement through Two Stage Open Book and Supply Chain Collaboration increase the time and opportunity to incorporate the whole team's contributions. The Ministry of Justice Cookham Wood project reported '*improved design coordination and change management at an early stage prior to construction, including liaison with the governor*', resulting in 20% agreed cost savings⁵⁶.

According to the European Directives 2014/23/EU, 2014/24/EU a 2014/25/EU⁵⁷, public procurement should not be purely cost-focussed but should take into consideration the entire life cycle of the asset. Procurement processes can contribute to the transformation of improved economic value that encompasses cost and time savings, enhanced quality, extended warranties and reduced operational, repair and maintenance costs, plus improved social value to cover benefits to end users and stakeholders, benefits to communities at local and regional levels, improved training and employment outputs and reduced impact on the environment⁵⁸.

Digital technologies such as BIM can further support delivery of better assets both at the capital expenditure stage and during their operational lifecycle. Digital Built Britain identified the importance of a strategy by which '*development of BIM and asset data enabled FM and AM Contracts- including the FM and AM roles in using and maintaining BIM models*'⁵⁹. Digital information management can create accessible integrated data that uses '*a direct data chain between design, construction, commissioning and operation of assets to enhance social outcomes and, through data feedback mechanism, provide a basis for continued improvement in asset design and performance*'⁶⁰.

The closer integration of the design, construction and operation phases in the life of a built asset forms part of the UK Government's approach toward the Digital Twin. However, in order to support the operational potential of BIM, '*collaboration between*

⁵⁶ *Cookham Wood Trial Project* case study.

⁵⁷ Directive 2014/23/EU of the European Parliament and of the Council of 26 February 2014 on the award of concession contracts; Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC; Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC.

⁵⁸ *Collaborative Construction Procurement and Improved Value*, Mosey, D. Wiley 2019.

⁵⁹ *Digital Built Britain*, 2015, 24.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/410096/bis-15-155-digital-built-britain-level-3-strategy.pdf

⁶⁰ *Department for Digital, Culture, Media & Sport*.

*the participants involved in the construction projects and in asset management is pivotal to the efficient delivery and operation of asset*⁶¹.

5.5 The collaborative management of digital information exchanges

The UK Government Construction Strategy 2016 confirmed that *‘BIM is a way of working that facilitates early contractor involvement, underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining our assets*⁶². The majority of projects reviewed in the King’s BIM research linked successful BIM to a procurement model where *‘early contractor involvement and bringing tier 2 & tier 3 in early to advise on design has brought efficiencies*⁶³. The evidence suggests that BIM needs planned and integrated contributions from the main contractor and specialist trades working alongside consultants, and these are difficult to deliver under a traditional single stage procurement system.

King’s BIM research interviewees who worked with private sector developers described the benefits of using BIM in conjunction with the procurement of individual trade packages through construction management. They emphasised the need for different treatment of BIM according to the complexity and capabilities of different trades and explained the ways this can be achieved in a construction management procurement model⁶⁴.

Digital Built Britain described incremental progression in the development of BIM where *‘collaborative models of working facilitated by data will permit greater engagement with lower tier suppliers*⁶⁵. In order to achieve these objectives, BIM can be more closely connected to an integrated approach to early supply chain involvement. For example, on the Ministry of Justice Cookham Wood project alliance:

- *‘The implementation of BIM has created improved value in the pre-commencement and construction phases of the project’*

⁶¹ ISO 19650-1:2018 p. vi.

⁶² Government Construction Strategy 2016–20, Section 22, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/510354/Government_Construction_Strategy_2016-20.pdf

⁶³ *Enabling BIM Through Procurement and Contracts*.

⁶⁴ Construction management is a procurement model under which there is no main contractor. Instead the different trades are appointed direct by the client alongside a consultant construction manager.

⁶⁵ *Digital Built Britain*, p. 23, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/410096/bis-15-155-digital-built-britain-level-3-strategy.pdf.

- ‘Virtual and actual prototypes have been produced to engineer out potential defects and clashes’
- ‘It is also envisaged that the data that BIM will capture will positively inform the future facilities management of the project.’⁶⁶

The connections between digital technology and the success of collaborative construction procurement appear in UK Government policy documents such as Digital Built Britain⁶⁷. New technologies demand increased precision in contractual exchanges, and in ways of capturing the information that support a more holistic approach to the full project lifecycle. According to the NBS National BIM Report⁶⁸ 2019, 71% of the respondents considered BIM as a more collaborative way of working⁶⁹.

However, the respondents to King’s College London Centre of Construction Law 2016 research expressed specific concerns about interoperability of information flow and data management⁷⁰. That research considered whether a BIM ‘*information manager*’ could be central to managing this interoperability but there was little evidence that companies allocate these responsibilities consistently⁷¹.

In addition, some parts of the construction sector face barriers in the accessibility of BIM and in understanding its full potential for optimizing whole life value.⁷² For BIM to be more accessible depends in part on new legal mechanisms that:

- Directly connect the team members, engaging them in collective decision-making
- Provide clarity in terms of the timing and integration of team members’ deliverables via an agreed timetable
- Encourage collaborative working and decision-making, reducing risk of misunderstandings and divided positions which lead to disputes.

King’s BIM research⁷³ put forward a case for creating an overarching horizontal agreement that brings the project team members under one collaborative umbrella while leaving their separate two-party appointments intact. For example, FAC-1 supports the

⁶⁶ *Cookham Wood Trial Project* case study.

⁶⁷ *Digital Built Britain*, footnote 56.

⁶⁸ *NBS National BIM Report*, 2019, 18-25, <https://www.thenbs.com/knowledge/national-bim-report-2019>.

⁶⁹ *NBS National BIM Report*, 18-25.

⁷⁰ *Enabling BIM through Procurement and Contracts*.

⁷¹ *ISO 19650*.

⁷² *Enabling BIM Through Procurement and Contracts*.

⁷³ *Enabling BIM Through Procurement and Contracts*.

use of new technology such as BIM and integrates each party's agreed approaches to design, supply chain engagement, costing, joint risk management and programming⁷⁴. Other FAC-1 provisions enable alliance members to seek improved value through BIM by clarifying:

- Data transparency and team integration through direct relationships under the multi-party structure and agreed objectives⁷⁵
- Agreed software and clarity as to reliance on data in the communication systems and template documents⁷⁶
- Mutual reliance on agreed BIM deadlines, gateways and interfaces in the timetable for agreed alliance activities⁷⁷
- Flexibility to agree any combination of BIM contributions through the multi-party structure⁷⁸
- Flexibility to bring in BIM contributions from specialist sub-contractors, suppliers, manufacturers and operators through Supply Chain Collaboration⁷⁹
- Direct mutual licences of intellectual property rights⁸⁰
- Integration of BIM management with governance and clash resolution through the core group and early warning provisions and through the alliance manager⁸¹
- Flexibility to obtain BIM contributions from additional alliance members involved in the occupation, operation, repair, alteration and demolition of a completed projects and tasks⁸²
- Potential for BIM to enable learning and improvement from project to project and from task to task⁸³.

⁷⁴ *Collaborative Construction Procurement and Improved Value.*

⁷⁵ Through the FAC-1 and TAC-1 multi-party structure, the Schedule 1 *Objectives* and the clause 13 limits on confidential information.

⁷⁶ In the FAC-1 and TAC-1 clause 1.9.3 provision for communication systems, the FAC-1 Schedule 5 provision for *Template Project Documents* and the TAC-1 provision for *Template Order Documents*.

⁷⁷ In the FAC-1 and TAC-1 Schedule 2 *Timetable* and the clause 6 *Alliance Activities*.

⁷⁸ Through the FAC-1 and TAC-1 multi-party structure and under the clause 1.11 and the Appendix 2 *Joining Agreements*.

⁷⁹ Through FAC-1 and TAC-1 clause 6.3 *Supply Chain Collaboration* and under the clause 7 *Order procedure*.

⁸⁰ FAC-1 clause 11.

⁸¹ In the FAC-1 and TAC-1 clause 1 *Core Group* and *Early Warning* provisions and the clause 5 *Alliance Manager* role.

⁸² Under the FAC-1 and TAC-1 Schedule 1 *Success Measures* and *Targets*.

⁸³ Under the FAC-1 and TAC-1 Schedule 1 *Success Measures* and *Targets*.

5.6 BIM as an integrator of project information

It is a misconception to assume that any digital medium automatically improves communication, or that digital technology is a substitute for collaborative construction procurement. To try to implement one without the other is a missed opportunity, and commentators have suggested that:

- *‘What partnering needed to succeed was BIM and this risk-managing collaboration concept will probably return to favour in supply chain relationships’⁸⁴*
- *‘The industry’s route map to collaboration and high efficiency new delivery models can only be underpinned by BIM and the importance of its adoption cannot be overestimated’⁸⁵*
- *‘Establishing a ‘single source of truth’ on projects for monitoring projects early, potentially supported by collaborative technology, helps to minimize misalignments and enable corrective action’⁸⁶.*

The future outlined in BIM2050 included the prediction that *‘design consultants and principal contractors will be appointed simultaneously, early in the lifecycle, to enable concurrent working at outline business case stage’⁸⁷*. Arguably, only the early, direct contractual relationships that can be created between the members of a collaborative alliance support this level of team integration, enabling collective decision-making under *‘multi-party contracts to discourage legal disputes and costly litigations’⁸⁸*.

An alliance contract can support a procurement model that brings BIM contributors into a strategic relationship. It can set out value-adding digital activities and processes that use BIM to build reliable shared data and mutual confidence. It can also help BIM to provide the necessary links between the capital and operational phases of a project and to create a database for the repair, maintenance and operation of the completed project.

ISO 19650-1,2:2018 proposed a common path for the implementation of information management through BIM. In order to create and operate a collaborative working environment, the Information Management standard BS EN ISO 19650-1:2018 stresses that:

⁸⁴ Saxon, R. (2013), 5.27. <https://cic.org.uk/news/article.php?s=2013-04-25-cic-publish-growth-through-bim-by-richard-g-saxon-cbe>

⁸⁵ *Modernise or Die*, p.36.

⁸⁶ *Reinventing Construction Through a Productivity Revolution*, p.8.

⁸⁷ *Built Environment*, 2014, p.23, <https://bim2050.wordpress.com/publications/>.

⁸⁸ *Built Environment*, p.23.

- *‘The recommendation and requirements for information management in ISO 19650 series are based on appointing, lead appointed and appointed parties working collaboratively together, and all parties should participate in the implementation of the ISO 19650 series’*
- *‘True collaboration working requires mutual understanding and trust and a deeper level of standardised process than has typically been experienced, if the information is to be produced and made available in a consistent timely manner’*
- *‘Collaboration between the participants involved in construction projects and in asset management is pivotal to the efficient delivery and operation of assets.’⁸⁹*

However, the ISO 19650 standards omit an important missing link, namely a formal enabler through which to create and sustain a collaborative delivery platform for project and programme delivery. A horizontal agreement which integrates the team and enables joint working can provide a new means for BIM to underpin agreed collaborative approaches to design, supply chain engagement, costing, risk management and programming.

5.7 An Integrated Information Management Contract

Based on lessons learned from case studies and consultation with case study teams, the research team developed a model for a multi-party *‘Integrated Information Management Contract’* governs the interfaces and relationships between team members who use information management based on BIM. This model will enable team members to agree directly their mutual BIM commitments in relation to one or more projects, and to implement these commitments transparently and collaboratively in order to get the best out of information management.

The model Integrated Information Management Contract complies with the ISO 19650 series *‘Organisation and Digitisation of Information about building and civil engineering works, including Building Information Modelling (BIM) – Information Management using Building Information Modelling’* (‘ISO 19650’), and reflects the ISO 19650 propositions that:

- *‘Collaboration between the participants involved in construction projects and in asset management is pivotal to the efficient delivery and operation of assets’*

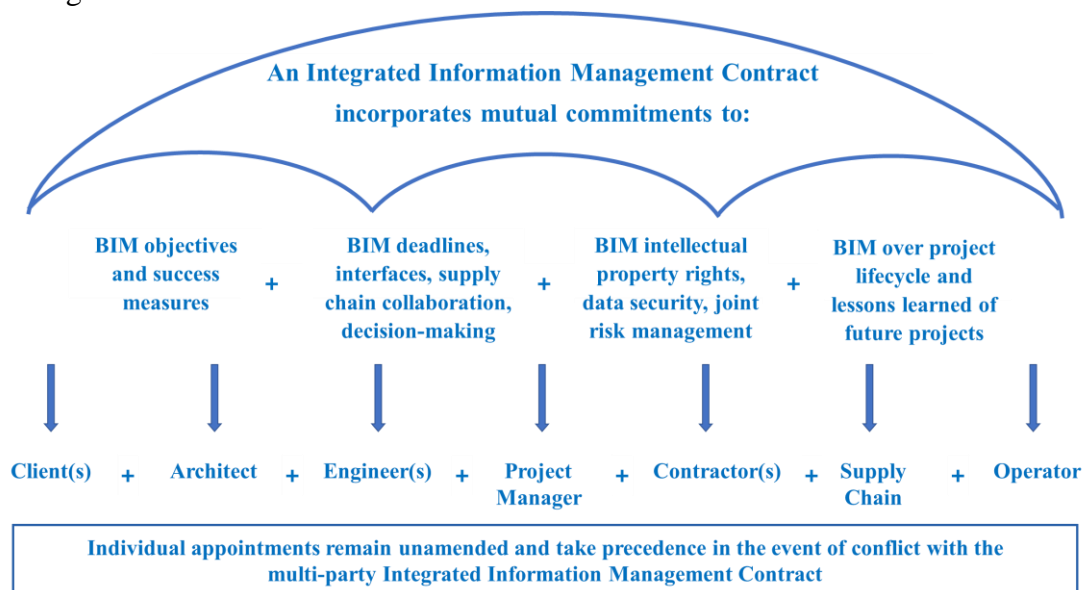
⁸⁹ ISO 19650.

- A significant outcome from collaboration is ‘*the potential to communicate, reuse and share information efficiently and to reduce the risk of loss, contradiction or misinterpretation*’⁹⁰.

The multi-party structure and processes of the model Integrated Information Management Contract support the implementation of specific ISO19650 requirements which are defined, quoted and cross-referenced throughout. The direct mutual connections established by the model also reflect the overarching ISO19650 requirements for:

- ‘*appointing, lead appointed and appointed parties to work collaboratively together*’ (ISO 19650-1 clause 4.2)
- ‘*information container based collaborative working*’ (ISO 19650-1 clause 9)
- ‘*collaborative production of information*’ (ISO 19650-2 clause 5.6.6).

The model Integrated Information Management Contract uses the FAC-1 Framework Alliance Contract as its starting point, creating a multi-party collaborative integrator for the management of digital information over the whole life cycle of any project or asset. This does not amend the individual roles and appointments agreed with each team member. Instead, it provides the contractual systems that are needed to integrate these roles and appointments and to create and sustain a shared understanding of information management.



⁹⁰ ISO 19650.

Figure 1: Operation of FAC-1 as an Integrated Information Management Contract

The Operation of FAC-1 as an Integrated Information Management Contract is illustrated in Figure 1. The research team selected FAC-1 as the basis for the model Integrated Information Management Contract because:

- FAC-1 is widely recognised by the construction industry and its clients as a flexible and effective collaborative integrator for team members working on a single project or on multiple projects
- FAC-1 has been adopted on procurements with a total value over £90 billion⁹¹
- The December 2020 UK *'Construction Playbook'* emphasises that a *'successful framework contract should be based around principles that align objectives, success measures, targets and incentives so as to enable joint work on improving value and reducing risk'*⁹²
- The Playbook's ambitions include the further embedding of digital technologies through *'a common framework of standards and protocols that will enable secure, resilient data sharing across organisations and sectors'*⁹³
- The Playbook states that FAC-1 *'is a good example of a standard form framework contract that can achieve this and many of the ambitions set out in this Playbook'*.⁹⁴

The use of FAC-1 as the basis for an Integrated Information Management Contract establishes and sustains a collaborative approach to information management through multi-party systems which:

- State shared objectives and success measures in relation to information management
- Support selection by value and early supply chain involvement in information management activities
- Optimise and integrate information management contributions from all team members
- Connect and integrate agreed deadlines and interfaces between team members for each stage of information management exchanges, reviews and approvals
- Regulate and support consistent management of the Common Data Environment

⁹¹ <http://allianceforms.co.uk/> News and Users.

⁹² *Construction Playbook*, p. 42.

⁹³ *Construction Playbook*, p. 20.

⁹⁴ *Construction Playbook*, p. 42.

- Sustain a collaborative environment where data integrity and security are preserved
- Create a transparent decision-making forum through which team members consider and agree proposals for improved value emerging from information management
- Enable joint risk management by reference to a shared risk register and agreed actions to resolve problems such as clashes between information management contributions
- Create and regulate direct intellectual property licences and data security commitments between team members
- Integrate information exchanges over the life cycle of each project, including the digital information required for safety and quality in the design, construction and operational phases of a built asset
- State how lessons learned through information management are applied on future projects.

The model Integrated Information Management Contract is based on learning from teams who have shown how the combination of information management with a collaborative integrator can deliver improved value and reduced risks. Relevant case studies include UK Government Trial Project teams at Cookham Wood and HMP Berwyn, the Liscate School team in Milan and the Construction Playbook case study project at Five Wells, Wellingborough. FAC-1 is currently being trialled by the UK Government as an Integrated Information Management Contract for the procurement and delivery of the £1 billion Ministry of Justice New Prisons Programme which is a Construction Playbook pathfinder.

Other contractual mechanisms supporting the use of information management based on BIM are provided in the JCT 2016, NEC4 and PPC2000 standard form contracts, and in the supplement to any contract form comprising the ‘Information protocol to support BS EN ISO 19605-2 the delivery phase of assets’⁹⁵. However, there is a strong case for optimising the effectiveness of integrated information management based on BIM by using an overarching, multi-party Integrated Information Management Contract that supports and connects the information management activities governed by multiple separate contracts. This model is designed for use with FIDIC2017, JCT2016, NEC4, PPC2000 and other standard or bespoke forms in any jurisdiction.

⁹⁵ [Information-Protocol-to-Support-BS-EN-ISO-19650-2_Edition-2.](#)

The information management deliverables of each team member are set out in their separate appointments. The model Integrated Information Management Contract does not increase these deliverables: it describes the integrated relationships and processes that help team members to achieve their information management deliverables by working efficiently together. The model provides a shared timetable for the incremental development of information management deliverables and a system for additional information management contributors to join the team.

The model Integrated Information Management Contract enables clients and other team members to plan and agree information management requirements and processes during the early planning stages of a project when the data requirements are not yet fully defined, and to seek improved value throughout all stages in the procurement and delivery cycle. It creates an opportunity to agree, cultivate and manage important collaborative behaviours and relationships. It can incorporate amendments that reflect the particular requirements of different clients and team members working in different sectors and in different jurisdictions.

In the model Integrated Information Management Contract at Annex 1

- The text in black reproduces standard form FAC-1 wording
- The text in blue explains the details to be drafted and inserted in the FAC-1 *Framework Alliance Agreement* and in Schedules 1 to 6
- All defined words and expressions appear in *italics*
- Words and expressions which correspond to standard words and expressions appear in normal print and are defined in Appendix 1 of the published standard form FAC-1 *Framework Alliance Contract*
- Words and expressions which are based on ISO 19650 appear in bold print and are defined in Appendix 6 Part 2 of the model.

6 Collaborative procurement and improved value

6.1 Improving value through collaborative procurement

Collaborative procurement practices need to demonstrate benefits for public and private sector clients and their teams in terms of improved value. Sustainable collaborative procurement models also need to balance cost savings with other improvements in economic value and with improvements in social and environmental value. For these purposes, team members should agree how they define value, what improvements they expect and how these improvements will be delivered.

The ISO 44001 implementation guide ‘*addresses the creation of value concept*’ and explains that organizations should ‘*identify external and internal issues and the needs and expectations of ... stakeholders and how value is delivered to them*’⁹⁶. The ways of delivering value should also be set out in agreed processes, contributions and deadlines that are supported by contractual commitments.

ISO 44001 suggests that collaboration should demonstrate improved value in terms of:

- *‘Delivery performance and outputs*
- *Improved risk profile*
- *Continued alignment of objectives*
- *Behavior and trust*
- *Enhanced collaborative profile/skills*
- *Additional value created*
- *Issue management*’⁹⁷.

When seeking improved value, ISO 44001 proposes that a collaborative team needs to:

- *‘Define what ‘value’ means to the collaborative partners*
- *Provide a mechanism for the capture of innovation and ideas for improvement*
- *Provide a method for performing analysis and evaluation of ideas and innovations against relevant criteria ...*
- *Establish a method for reviewing the success or failure of value creation initiatives and record lessons learned for future use*’⁹⁸.

These propositions have been demonstrated on UK ‘*Trial Projects*’ mentored by the King’s College London Centre of Construction Law over the period from 2013 to 2018. Evidence was collected through the detailed analysis by reference to stated benchmarks, which showed how the teams working on these projects agreed and delivered significant improvements in economic, social and environmental value. The research team have considered how this evidence and evidence from other case studies illustrates the improved value that can be achieved through collaborative procurement in terms of:

- Achieving benefits for all team members
- Improving cost certainty and cost savings
- Improving other economic value
- Improving social value

⁹⁶ ISO 44001 Guide, <https://www.lrq.com/en-gb/resources/iso-44001-implementation/>.

⁹⁷ ISO 44001.

⁹⁸ ISO 44001.

- Meeting net zero carbon targets (which is explored in detail in Section 7 of this White Paper).

6.2 Achieving benefits for all team members

In order to be sustainable, a collaborative procurement model needs to reward all team members. Clients and their advisers, in line with the ‘*Two Stage Open Book*’ guidance, should use the ‘*maximum opportunities to learn in detail what matters most to the tier 1 contractor and to each tier 2 or 3 subcontractor and supplier in how they go about their work, and what steps can be taken to improve the ordering and organization of this work so as to maximize the opportunities for savings and other improved value*’.⁹⁹

For example, the early review and validation of designs and costs by contractors and subcontractors can significantly reduce the design risks for consultants, leading to the safety, quality and buildability of those designs being signed off by all team members. In 2016, the Civil Engineering Contractors Association reported that ‘*the widespread adoption of early contractor involvement by clients would drive down costs for both clients and contractors.*’¹⁰⁰ Proven contractor benefits from collaborative procurement, cited in Two Stage Open Book guidance, also include:

- ‘*Early appointment ... that creates a stable basis for pre-construction phase activities leading up to authority for the project to commence on site*’
- ‘*Open Book costing combined with prior agreement of ... fees/profit/overheads to ensure that agreed cost savings do not erode margins*’
- ‘*Joint working during the pre-construction phase that enables the tier 1 contractor to influence robust programming and early risk management activities, so that the project proceeds to the construction phase on an agreed basis supported by maximum information*’
- ‘*Creation of an environment in which ... contractors can demonstrate savings and other improved added value in order to obtain additional work, contract extensions and other agreed incentives such as shared savings*’¹⁰¹.

Sir Michael Latham commented in 2010 that collaborative ESI ‘*motivates the team to drive down cost in a systematic way. It also helps identify carbon reduction and energy efficiency measures, as well as opportunities for employment and skills during the conditional pre-construction phase. These can be properly costed and jointly assessed*

⁹⁹ *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration*, p. 16.

¹⁰⁰ <https://www.ceca.co.uk/publications/>.

¹⁰¹ *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration*, p. 16.

*with key subcontractors and manufacturers at a time when all team members have the same objective, namely to finalise a brief within budget so that work can proceed on site*¹⁰².

6.3 Improving cost certainty and cost savings

For a client to obtain cost savings on a project may suggest a reduction or compromise in quality or some other aspect of the project. However, as considered in Section 6.4, collaborative ESI provides mechanisms to achieve cost savings that do not cut corners, that are agreed in advance and that are not to the financial detriment of any team member. In addition, the Trial Projects reported how agreed cost savings can be combined with other improved value such as extended warranties, social benefits and sustainability initiatives.

The Trial Projects show how consultants working together with contractors and subcontractors early in the design phase can improve cost certainty by building up accurate fees, margins and cost components rather than a single stage bid price with little evidence of how it was arrived at. The Trial Project case studies also provide robust evidence of agreed cost savings that are attributable, for example, to:

- Accelerated mobilization so as to increase productivity
- Revised designs such as a more efficient site layout
- A revised programme with a more economical sequence
- A revised approach to risks, for example following additional site investigations
- Revised working methods to improve efficient interfaces between team members.

A collaborative approach to risk management activities during the pre-construction phase can also identify ways to save cost by reducing or eliminating risk contingencies. For example, Trial Projects have required that all proposed risk contingencies are notified to the Client by other team members prior to their pre-construction phase appointments and are only included in agreed prices after joint reviews and after implementation of agreed risk management activities.

Trial Project results also show how savings can be enhanced by learning from project to project and by Supply Chain Collaboration. For example, the cost savings on the housing procurement comprising the SCMG Trial Project averaged 14% over the life

¹⁰² *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration*, p. 16.

of collaborative frameworks led by Hackney Homes and Homes in Haringey, plus average price rises substantially below the tender price inflation forecasts provided by independent consultants¹⁰³.

6.4 Improving other economic value

Collaborative procurement establishes new lines of communication between the Client, the Principal Designer, the Principal Contractor and other consultants, contractors, subcontractors, suppliers, manufacturers and operators. These in turn create opportunities for improved integration, information and innovation which can lead to better design solutions and can encourage extended warranties. For example, through ESI supply chain collaboration, the SCMG housing framework alliance secured the *'Availability of extended warranties above industry standards, managed by suppliers/installers, such as windows warranted for 30 years.'*¹⁰⁴

6.5 Improving social value

Collaborative procurement increases opportunities to deliver social value, and the Construction Playbook requires that *'Social value should be explicitly evaluated in all central government procurement, where the requirements are related and proportionate to the subject-matter of the contract'*¹⁰⁵. Social value can include improved skills and employment, improved health and safety at work, new opportunities for local and regional businesses and a range of community benefits.

The Public Services (Social Value) Act 2012 requires all public sector bodies to factor in economic, social and environmental well-being when commissioning public services contracts. In addition, the September 2020 Procurement Policy Note (PPN 6/20) launched a new model to deliver social value through government commercial activities, requiring government organisations to *'use this model to take account of the additional social benefits that can be achieved in the delivery of its contracts, using policy outcomes aligned with Government priorities'*.¹⁰⁶

PPN 6/20 requires that social value is explicitly evaluated in all central government procurements, rather than just *'considered'* as required under the Public Services

¹⁰³ SCMG Trial Project case study.

¹⁰⁴ SCMG Trial Project case study.

¹⁰⁵ Construction Playbook, p.37.

¹⁰⁶ <https://www.gov.uk/government/publications/procurement-policy-note-0620-taking-account-of-social-value-in-the-award-of-central-government-contracts>

(Social Value) Act 2012, wherever these social value requirements are related and proportionate to the subject matter of the contract. The range of social value described in PPN 6/20 covers:

- Helping local communities to manage and recover from the impact of COVID-19
- Creating new businesses, new jobs and new skills
- Increasing supply chain resilience and capacity
- Effective stewardship of the environment
- Reducing the disability employment gap
- Tackling workforce inequality
- Improving health and wellbeing
- Improving community integration.

Employment and training opportunities are examples of the social value that can be delivered as part of a construction project. The government has recognized the importance of making *‘effective use of public procurement to encourage skills development in construction supply chains’*¹⁰⁷. Collaborative construction procurement can create and deliver commitments to improve employment and skills opportunities throughout the supply chain and can use detailed and proportionate benchmarks for this purpose such as those provided by the Construction Industry Training Board.

For example, Hackney Homes and Homes for Haringey used the SCMG housing framework alliance to create *‘additional employment and skills opportunities for individuals, for example 46 new apprenticeships over the first 18 months of the Hackney programme, plus establishment of the Building Lives Training Academy where apprentices who have got NVQ Level 1 are engaged by constructors/specialists according to demand of ongoing work so as to achieve NVQ Level 2 after 15/18 months’*¹⁰⁸

Social value can include increased opportunities for SMEs and for local and regional businesses. The Construction Playbook recognizes that *‘SMEs are experts in their fields and can provide insight into MMC, innovative technologies and ways to minimize the GHG footprint of the proposed solutions across their whole lifecycle’*.¹⁰⁹ SMEs and local and regional businesses can be selected and appointed directly by the client, for example by sub-dividing a project into specialist packages through collaborative construction management. Where a client does not want to take on the responsibility of appointing local and regional businesses directly, it can create new opportunities by

¹⁰⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731871/construction-sector-deal-print-single.pdf

¹⁰⁸ SCMG Trial Project case study.

¹⁰⁹ Construction Playbook, p.23.

working with tier 1 contractors and using Supply Chain Collaboration to explore the benefits of them appointing local and regional subcontractors, suppliers, manufacturers and operators.

For example, the SCMG housing framework alliance established the ‘*early joint appointment of a comprehensive range of SME Tier 2 and Tier 3 supply chain members*’ and created ‘new opportunities for SME subcontractors and suppliers. They described how:

- ‘*Through the SCMG systems, new lines of client contact are established with tier 2 and tier 3 supply chain members at an early stage in the preconstruction process so that they can make maximum contributions to design, resident consultation, surveying and programming and can work in conjunction with the client and tier 1 contractors*’
- ‘*The SCMG systems have demonstrated a breakthrough in enabling public sector clients to deal directly with key subcontractors and suppliers so as to ensure they build up fully integrated working relationships*’
- ‘*A multi-client, multi-contractor team has engaged with a wide range of SME subcontractors and suppliers under a standardized system*’¹¹⁰.

7 Collaborative procurement and Net Zero Carbon

7.1 How can collaborative procurement support net zero carbon?

The research team selected the imperative of net zero carbon as the first focus for testing the different elements of the collaborative machinery that underpin strategy, procurement, contracting and management. The Construction Playbook expects contracting authorities to ‘*set out strategies and plans for achieving net zero GHG emissions by or ahead of 2050 for their entire estate/infrastructure portfolio*’¹¹¹, and it states that ‘*systems and processes should be in place to ensure their projects and programmes deliver on the targets set*’¹¹².

Company directors have a statutory duty to have regard to ‘*the impact of the company’s operations on the community and the environment*’¹¹³ and there is a pressing need for approaches to procurement that fulfil this duty. For example, the search for ways to maximize energy efficiency and reduce waste can benefit from ideas developed not only by design consultants but also by contractors, subcontractors, manufacturers and

¹¹⁰SCMG Trial Project case study.

¹¹¹ Construction Playbook, p.5.

¹¹² Construction Playbook, p.5.

¹¹³ Companies Act 2006, Section 172.1(d).

operators.

The Construction Playbook states that *‘Contracting authorities should require that solutions put forward by potential suppliers are accompanied by a whole life carbon assessment. This should be conducted in collaboration with the wider supply chain, reflecting ways of minimising the GHG emissions across the life of the asset’*.¹¹⁴ In order to evaluate and utilize proposals for improved sustainability, it is essential to engage with supply chain members using ESI during the planning and pre-construction phase of the project. By inviting proposals at a time when they can be jointly reviewed, costed and integrated in the delivery processes, a project team can deliver significant reductions in environmental impact.

Relevant contributions include:

- Proposals as to the most buildable and least wasteful interpretation of consultant designs¹¹⁵
- Proposals in respect of reduced waste and increased recycling¹¹⁶
- Proposals as to the efficient use of energy on site, including modern methods of construction such as off-site fabrication¹¹⁷
- Proposals as to the efficient use of energy by reduced maintenance and repair in the operation of the built facility¹¹⁸.

Collaborative procurement can deal with the conflicting pressures of cost management and improved sustainability whereas these pressures can undermine a traditional single stage approach. If single stage bidders are asked to put forward sustainability proposals, they may hold back or compromise good ideas in order to reduce their bid prices. Following a single stage bid, clients may reject sustainability proposals as unaffordable or unbuildable having had no preconstruction phase opportunities to investigate them in detail.

Collaborative ESI and Supply Chain Collaboration enable the cost and quality benefits of sustainability proposals to be developed thoroughly and to be assessed by all team members. This provides clients, as noted by Housing Forum in *‘Stopping Building Failures’*, with *‘the means to evaluate the cost of environmental issues ...and to balance*

¹¹⁴ *Construction Playbook*, p. 23.

¹¹⁵ Case studies 4 (c) and 4 (e).

¹¹⁶ Case study 4(e).

¹¹⁷ Case study 4 (b) and 4 (c).

¹¹⁸ Case studies 4(b) and 4(l).

*this against their demonstrable benefits*¹¹⁹. For example, on a five-year, multi-client programme, the regional National Change Agent housing consortia achieved: *'efficiency savings totalling £226 million from cumulative expenditure of £1.6 billion', 'over 500 apprentices successfully completing NVQ training to levels 2 and 3 and helped into full employment, with 80% retention', 'establishment of numerous SME businesses and social enterprises'* and *'a joint initiative with WRAP to halve waste to landfill.*¹²⁰

The new lines of communication and the additional time created for joint working on the Trial Projects led to team members offering new proposals for sustainable solutions that were practical and affordable within the Client's budget. Trial Projects also showed how environmental initiatives can be combined with support for SME businesses, particularly where the scale of the programme enables consistent procurement practices and where collaborative systems facilitate an exchange of ideas.

For example, the SCMG housing framework alliance reported subcontractor/supplier innovations in proposed new materials and development of specifications, such as *'future-proofing green roofs at no additional cost and upgrading windows from Grade C to Grade A at no additional cost.'* The SCMG alliance also reported that supply chain members offered *'improved repairs and maintenance through, for example, self-cleaning glass on high rise blocks'* and *'more sustainable solutions including external wall insulation.'*¹²¹

Forming long-term strategic relationships and getting the best results from early supply chain involvement require planned and structured procurement processes and contractual commitments. Relationships established under a multi-party model, where shared objectives, targets and success measures are formalised, enable a team to develop the mutual confidence and shared information that are necessary to enhance project outcomes. Long-term contracts of the type required for the adoption of MMC are already in use by clients such as Crown Commercial Service and Ministry of Justice¹²².

¹¹⁹ *Stopping Building Failures.*

¹²⁰ *SCMG Trial Project case study*

¹²¹ *SCMG Trial Project case study*

¹²² FAC-1 and TAC-1 are used by these clients.

7.2 How can a collaborative procurement strategy tackle climate change?

The Construction Playbook considers the features of a procurement strategy that will deliver improved environmental outcomes. It expects contracting authorities to *'set out strategies and plans for achieving net zero GHG emissions by or ahead of 2050 for their entire estate/infrastructure portfolio'*, and that *'systems and processes should be in place to ensure their projects and programmes deliver on the targets set'*¹²³.

Procurement strategies should adopt an approach to net zero that focuses on outcomes and whole life value alongside cost, time, safety and other measures of performance. The Construction Playbook states that:

- an outcome-based strategy will *'help suppliers understand contracting authorities ambitions without being prescriptive. (...)*
- *Clear and measurable outcomes should be set at the outset of a project or programme*
- *In developing these, projects and programmes should focus on whole life value'*¹²⁴.

In developing a procurement strategy, the Construction Playbook requires that contracting authorities *'analyse information from past projects and programmes'* in order to provide *'decision-makers with key insights and data to make more informed and intelligent investment decisions'* and to *'better understand whole life costs and value'*¹²⁵. The January 2021 Infrastructure and Projects Authority Mandate includes a commitment to *'create a Benchmarking Hub and make benchmarking data available on key assets to underpin and challenge project investment cases.'*¹²⁶

Analysis of information from past projects and programmes should inform the framework strategy and the budgeting through which framework providers, clients and suppliers establish:

- The likely scale of the framework programme and of the pipeline or pipelines of work planned or committed by framework clients

¹²³ *Construction Playbook*, p.5.

¹²⁴ *Construction Playbook*, p. 24.

¹²⁵ *Construction Playbook*, p.11.

¹²⁶ *Infrastructure and Project Authority Mandate*, p. 4.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/949868/IPA_Mandate_2021.pdf

- The likely scale of the resources that the framework provider, clients, manager and suppliers will commit to framework activities such as value improvement and risk management.

The Playbook requires that *‘Projects and programmes should undertake benchmarking of key project deliverables including cost, schedule, GHG emissions and agreed outcomes at each stage of business case development’*, and that clients should create a *‘Should Cost Model’* that provides *‘a forecast of what a project or programme ‘should’ cost over its whole life, including the build phase and the expected design life’*¹²⁷.

Clients and advisers should use pre-procurement consultation to inform their strategy so as to gain insights as to the potential for industry to offer the required or desired solutions. Attracting and adopting supplier proposals that use emerging technologies and innovations will depend on a strategy that maps out an outcome-based approach to supplier evaluation and a clear understanding as to the treatment of supplier intellectual property rights in the net zero proposals that they submit.

A net zero procurement strategy should state:

- How supplier net zero proposals will form part of the quality criteria that move the evaluation focus away from lowest price and towards a deeper understanding of bidders’ capabilities
- The purpose of seeking competitive supplier net zero proposals, including the processes by which these proposals are reviewed, developed and adopted once a supplier is appointed, and the basis on which these proposals will then be used to deliver improved net zero outcomes
- How confidentiality and intellectual property rights in supplier net zero proposals will be respected
- By what process the clients and suppliers will seek agreement to share approved supplier net zero proposals with other suppliers
- How the recognition of supplier net zero proposals in evaluation, and the success of supplier proposals in delivering improved net zero outcomes, will affect the award of future work and the application of other incentives¹²⁸.

Procurement strategies can establish clear sustainable objectives that should then be translated into actions by creating new lines of communication, clear commitments and clear timescales for clients and industry to agree sustainable solutions that are practical and affordable.

¹²⁷ *Construction Playbook*, p.36.

¹²⁸ *Constructing the Gold Standard* Sections 3 and 21.

Many clients have already made commitments to adopt a strategic approach to achieving net zero commitments. These commitments need to crystallise when they are expressed in a procurement strategy, in the commitments made when teams are evaluated, in the machinery set out in contracts and in the systems used for project and programme management. An outcome-based net-zero procurement strategy should identify:

- How the procurement exercise can deliver the net-zero carbon related client outcomes using outcome-based specifications
- How it will set clear programme and project outcomes that align with net zero strategic priorities
- How to develop a whole life carbon assessment with the wider supply chain, reflecting ways of minimising GHG emissions across the life of the assets to be procured.

7.3 How can collaborative team selection tackle climate change?

As with other measures of value, net zero carbon commitments need to be delivered through agreed machinery rather than simply through demands, and that machinery is likely to include a competitive process for selecting team members. The success of this process will depend on the full and accurate exchange of information and on the balanced assessment of net zero proposals in the context of other evaluation criteria.

Improved environmental value is consistent with a competitive procurement process if that process is transparent and logically constructed. An effective value-based and net-zero outcome-based procurement process should:

- Use specifications that focus on the net-zero desired client outcomes
- State how intellectual property might arise from supplier proposals and how that intellectual property will be managed through the life of the contract
- Evaluate supplier solutions accompanied by whole life carbon assessments and proposals for minimising GHG emissions across the life of the assets procured
- Make clear the criteria for performance measurement, how they will be applied and how they will affect the award of future work and other supplier incentives¹²⁹.

¹²⁹ *Constructing the Gold Standard*, Sections 3 and 21.

Crown Commercial Service reports that their *'framework specifications emphasise delivery of sustainability through the design process, materials selection, construction techniques and construction methods implemented, supporting 2050 net zero commitments, and ultimately a whole life carbon approach. Suppliers are mandated to identify opportunities to clients on achievement of sustainability objectives. Specifications also contain more detailed requirements, shoring-up these higher-level objectives, for example:*

- *Adopting the application of BRE's Environmental Assessment Methodology (BREEAM)*
- *Promoting, conserving and enhancing biodiversity, including use of Biodiversity Action Plans or equivalent, and the management of Sites of Special Scientific Interest (SSSIs)*
- *Following the principles of the Green Public Procurement (GPP) voluntary instrument*
- *Adherence to packaging regulations and the reduction of embedded carbon, particular important in Building Materials'.¹³⁰*

Procuring for net zero needs to deal with the conflicting pressures of net zero innovations and other proposals with their impact on cost, time, risk and other project factors. Reconciling these potential conflicts is partly dependent on a procurement process that includes sufficient time for the examination and agreement of the net zero proposals submitted by the selected suppliers. If bidders are asked to put forward net zero proposals that are assessed only in a single stage procurement process, they may hold back or compromise good ideas in order to reduce their bid prices. In addition, if there is no joint examination of net zero proposals by the clients, advisers and suppliers in order to assess their viability, then a client may reject those proposals as unaffordable or unbuildable having had no opportunity to investigate them in detail.

The Construction Playbook states that *'Contracting authorities should require that solutions put forward by potential suppliers are accompanied by a whole life carbon assessment. This should be conducted in collaboration with the wider supply chain, reflecting ways of minimising the GHG emissions across the life of the asset'.¹³¹* A systematic approach to obtaining, examining and agreeing supplier net zero solutions is set out in *'Two Stage Open Book'* techniques that whereby:

¹³⁰ *Constructing the Gold Standard*, p.21.

¹³¹ *Construction Playbook*, p.23.

- *‘At the point of selection of the Consultants and Tier 1 Contractor, Two Stage Open Book provides the basis for a transparent competitive process in respect of their fees/profit/overheads, and any other components of the project for which it is appropriate to test costing, such as risk contingencies and the provisional cost of particular proposals submitted.*
- *Evaluation of fees/profit/overheads and such other costs needs to be balanced appropriately against evaluation of qualitative proposals and the proven ability of the Consultants and Tier 1 Contractor to deliver the project/programme within the Project Budget cost ceiling*
- *At the point of selection of Tier 2/3 Subcontractors and Suppliers, Two Stage Open Book provides the basis for further transparent competition based on accurate costing and additional qualitative proposals*¹³².

Two Stage Open Book is a system of preconstruction phase project processes governed by the early appointment of a full project team that enables the detailed evaluation and validation of net zero carbon proposals. It creates the opportunity for project members jointly to examine and develop design, cost, risk and programme and for clients to make a fully formed assessment as to their options in respect of sustainable solutions and to evaluated and agree the best approaches to achieve net zero carbon targets.

Clients should ensure that the selection processes for consultants, contractors and other supply chain team members are fair and transparent by ensuring that the appraisal of bidders considers a balanced assessment of cost and quality combined with the other measurable proposals and capabilities required to underpin a value-based and net-zero outcome-based approach that is focused on whole life value, performance and cost. A balanced approach to evaluating tender proposals enables clients to test supplier proposals against their required and expected outcomes. The Construction Playbook sets a clear principle for the evaluation of bids looking for *‘better and greener delivery’* and establishes that *‘While cost is an important evaluation criterion, there will be many occasions where quality will be weighted higher than cost, recognising the importance of delivering quality public works projects and programmes, or meeting legal obligations such as net zero GHG emissions by 2050’*¹³³.

The Playbook recognises that clients will need to adopt new evaluation practices in order to achieve a clear understanding of the value that is offered, and it requires that:

¹³² *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration.*

¹³³ *Construction Playbook, p.57.*

- *‘Value-based procurement should be adopted at an organisational level and driven through a portfolio approach to projects and programmes’*
- *‘Evaluation – and evaluation criteria- should focus on value over cost’¹³⁴*
- *‘The quality evaluation criteria need to be sufficiently well developed and detailed to allow for the differentiation in scores between competing bids, to avoid too close or identical scores from bidders’¹³⁵*

The evaluation of net zero and whole life proposals needs to be integrated with financial and other evaluation criteria:

- The former Office of Government Commerce included among its critical factors for success the *‘award of contract on the basis of best value for money over the whole life of the facility, not just lowest tender price’* and *‘an integrated process in which design, construction, operation and maintenance are considered as a whole’*¹³⁶
- The 2018 Housing Forum report *‘Stopping Building Failures’* noted that *‘On housing programmes, the financial elements of the bid will include the construction costs, overheads and profits, costs of staff transferring as a result of TUPE (particularly on repairs and maintenance programmes), and the cost of any social value proposals including apprenticeship opportunities. However, there are other financial elements that can be evaluated including discount cost savings over the lifetime of the contract and life-cycle costs’¹³⁷.*

The Construction Innovation Hub’s Value Toolkit recognises that each project or programme has its own unique value profile by reference to the relative importance of four value categories:

- Natural (air, climate, water, land, resource, use, biodiversity)
- Social (influence and consultation, equality and diversity, networks and connections)
- Human (employment, skills and knowledge, health, experience)
- Produced (lifecycle cost, return, production, resilience)¹³⁸.

¹³⁴ *Construction Playbook*, p.56.

¹³⁵ *Construction Playbook*, p.57.

¹³⁶ *Achieving Excellence in Construction Procurement Guides*, OGC, 2007, 1

¹³⁷ *Stopping Building Failures*.

¹³⁸ <https://constructioninnovationhub.org.uk/value-toolkit/>

Outcome-based and net-zero based evaluation criteria should be detailed and measurable rather than vague commitments. They should look closely at a prospective supplier's objectives, requirements and expectations in terms of net zero carbon targets. An effective net zero procurement process should reflect:

- A clear understanding of value linked to desired and required outcomes
- How these outcomes align to net zero strategy and regulations
- A system and criteria that include evaluation of economic, social and environmental value where the requirements are related and proportionate to the subject-matter of the contract.

Evaluation by a public sector client is not restricted to price comparisons, and pursuant to the current 2015 Public Contracts Regulations must be on the basis of the '*most economically advantageous tender*'. This can be '*be identified on the basis of the price or cost, using a cost-effectiveness approach, such as life-cycle costing*', and may also '*include the best price-quality ratio, which shall be assessed on the basis of criteria, such as qualitative, environmental and/or social aspects, linked to the subject-matter of the public contract in question*'¹³⁹.

The UK 2021 Procurement Policy Note on *Taking account of Carbon Reduction Plans in the procurement of major government contracts* sets an evaluation methodology that includes supplier commitments to achieving Net Zero by 2050, emissions reported for all required scopes, submission of Carbon Reduction Plans and detailed environmental management measures including certification schemes and specific carbon reduction measures that will be in effect during the performance of the relevant contract.¹⁴⁰

The UK Government's Green Paper on '*Transforming Public Procurement*'¹⁴¹ proposes that the evaluation of bids should be based on '*Most Advantageous Tender (MAT)*' and that '*adopting MAT (together with accompanying guidance) should provide greater reassurance to contracting authorities that they can take a broader view of what can be included in the evaluation of tenders in assessing value for money including social value as part of the quality assessment*'¹⁴².

¹³⁹https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/560263/Guidance_on_Awarding_Contracts_-_Oct_16.pdf

¹⁴⁰Guidance on adopting and applying PPN 06/21, Selection Criteria, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/991623/Guidance_on_adopting_and_applying_PPN_06_21_Selection_Criteria_3_.pdf

¹⁴¹ <https://www.gov.uk/government/consultations/green-paper-transforming-public-procurement>

¹⁴² *Transforming Public Procurement*, December 2020, Cabinet Office Report CP 353, para 101 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943946/Transforming_public_procurement.pdf

In order to take full advantage of net zero proposals, the procurement process and contract should set out the systems by which these proposals will be:

- Accepted and implemented at framework level and project level or
- Reserved for later review and adoption, at the option of the client or
- Shared for wider review and adoption by other suppliers.

In order to attract supplier solutions, it is important to make clear in the procurement process the ways in which clients and suppliers may agree to share those solutions for the benefit of the project as a whole. The Playbook states that *'Trust is key and it is important that a mutually beneficial, open and collaborative approach is adopted during the process in sharing ideas and innovative solutions'*.¹⁴³ The evaluation and adoption of solutions submitted by suppliers in response to an outcome-based and net zero-based specification requires a clear understanding as to the licensing and protection of supplier intellectual property rights, and the Playbook states that:

- *'It is important to create a common understanding of what IP is and how it might arise from the contract'*
- *'IP should be managed through the life of the contract with clear responsibilities set out in the contract'*.¹⁴⁴

7.4 How can collaborative construction contracts tackle climate change?

Collaborative activities require coordination and clear timelines in order to create mutual confidence among team members that each will create and share the data that they all need to deliver the project. They also provide the machinery for coordination and the mutual commitments to agreed activities and timelines. The UK Construction Industry Council recommended that: *'An effective contract can play a central role in partnering. It sets out the common and agreed rules; it helps define the goals and how to achieve them; it states the agreed mechanism for managing the risks and the rewards; it lays down the guidelines for resolving disputes'*¹⁴⁵.

The search for net zero solutions requires innovations and efficiencies to be developed and embedded in the work not only of design consultants but also of contractors, subcontractors, manufacturers and operators. The Construction Playbook states that *'Projects and programmes should engage in innovative thinking from the start through early engagement. Research and innovation-based procedures which go beyond engagement to inviting the market to suggest novel solutions to problems should also*

¹⁴³ *Construction Playbook*, p.24.

¹⁴⁴ *Construction Playbook*, p.26.

¹⁴⁵ *Guide to Project Team Partnering*, Construction Industry Council, 2002, p. 12.

*be considered*¹⁴⁶. It requires that ‘*operators should be engaged early and continuously*’ in the project lifecycle¹⁴⁷.

Traditional two-party contracts entered into by each client with each supplier leave all parties without the assurance of a consistent approach to net zero carbon. They lack the direct connections and mutual commitments through which to integrate working practices, align differing interests and reconcile the rules of competition with the rules of collaboration.

Separate two-party contracts make it difficult to align the objectives, success measures, targets and incentives of clients, managers, suppliers and supply chain members. The two-party contracts created with each supplier are not visible to other suppliers, and this lack of transparency is unnecessary and inefficient. It contributes to an atmosphere of mutual distrust and limits the collaboration through which shared experiences, ideas and innovations can improve outcomes, improve value and manage risks.

Collaborative construction contracts are not a novel idea. The 1994 Latham Report identified the following collaborative features of a modern construction contract:

- A specific duty for all parties to deal fairly with each other, and with their subcontractors, specialists and suppliers, in an atmosphere of mutual cooperation.
- Clearly defined work stages, including milestones or other forms of activity schedule
- Integration of the work of designers and specialists
- A specific and formal partnering agreement that is not limited to a particular project
- Partnering arrangements that include mutually agreed and measurable targets for productivity improvements¹⁴⁸.

An effective collaborative construction contract should state the systems by which qualitative proposals, including net zero proposals, will be accepted and implemented at framework level and project level. It should link an outcome-based specification to the measurement of performance by reference to the achievement of net zero outcomes. It should state how performance measurement will recognise achievement of required and desired outcomes, including who evaluates the suppliers’ performance against outcome-based specifications, how feedback is shared and how it is used. Outcomes

¹⁴⁶ *Construction Playbook*, p.23.

¹⁴⁷ *Construction Playbook*, p.68.

¹⁴⁸ *Constructing the Team*, Section 4, 5 and 6.

should be objectively measurable as mutual trust between clients, managers and suppliers can be damaged where measurement is conducted privately or subjectively¹⁴⁹.

A collaborative contract supports the achievement of net zero carbon targets by providing for:

- Management systems that support collaboration and avoid disputes
- Contractual systems such as early supply chain involvement and supply chain collaboration to attract supplier and supply chain contributions
- Strategic relationships that align net zero objectives, success measures, targets and incentives with strategic commitments to joint work on improving environmental value and reducing environmental risk
- An action plan and timetable to convert net zero plans into actions
- Contractual foundations for innovation and investment in new technologies
- Contractual systems for integrating team contributions to whole life digital information management.

A collaborative contract should also describe the joint risk management processes through which clients, managers and suppliers exchange information in relation to the environmental risks they face and decide what actions to take. Many risks can be managed jointly by a collaborative team if they put the right contractual machinery in place, and the ISO 44001 international standard for collaborative business relationships states that *'an effective collaboration is one where the parties share responsibility as far as is practical in supporting the individual risk of the partners'*¹⁵⁰.

Contractual machinery for active management of environmental risks includes:

- A contractual system for the efficient sharing of risk information and agreement of risk management actions, enabling *'early risk work focused on achieving project strategic objectives and alignment'*¹⁵¹
- The use of ESI for *'exploring opportunities to develop solutions that help mitigate risk through joint working before construction commences'*¹⁵²
- A contractual structure that connects the framework provider, clients, manager and suppliers through systems for *'sharing of appropriate risk registers and transparent communication on risk allocation with prospective suppliers and the supply chain'*¹⁵³

¹⁴⁹ *Constructing the Gold Standard*, p.62.

¹⁵⁰ *ISO 44001-2017 Collaborative Business Relationship Management Systems - Requirements and Frameworks*.

¹⁵¹ *Construction Playbook*, p.49.

¹⁵² *Construction Playbook*, p.48.

¹⁵³ *Construction Playbook*, p.49.

- A multi-party framework level *'joint register with contracted suppliers which is aligned to project and wider outcomes'*¹⁵⁴ and which is managed and updated with agreed risk management actions and timescales.

Construction projects and programmes involve many environmental risks that cannot be fully assessed and dealt with in advance. The Playbook emphasises the need to *'apply a proactive risk management approach with suppliers incorporating early warning and joint decision-making'*¹⁵⁵. A construction contract should include machinery for proactive management of environmental risks using:

- Interconnected contractual early warning systems at framework level and project level¹⁵⁶
- A contractual core group or the equivalent comprising individuals representing the framework provider, clients, manager and suppliers who are required to manage risks collectively, who receive early warnings and who seek to agree risk mitigation actions¹⁵⁷.

7.5 How can collaborative relationship management tackle climate change?

ISO 44001 describes a system for joint issue resolution that:

- *'Defines a decision-making hierarchy*
- *Identifies and resolves issues at the earliest practicable opportunity*
- *Assigns importance, priority and/or timeframe, and responsibility for resolution at the optimum level*
- *Tracks the status of the issue: e.g. open, investigating, escalated, resolved*
- *Aligns with any agreement and/or contracting approach and integrated with lessons learned'*¹⁵⁸.

According to the Construction Playbook *'one of the most effective ways to deliver outcomes is to create sustainable contracting environments that promote collaboration*

¹⁵⁴ *Construction Playbook*, p.49.

¹⁵⁵ *Construction Playbook*, p.50.

¹⁵⁶ For example, in the standard form contracts NEC4 clause 15, PPC2000 clauses 3.7 and 27.3, FAC-1 and TAC-1 clause 1.8.

¹⁵⁷ For example, in the standard form contracts PPC2000 clauses 3.3 to 3.6, FAC-1 and TAC-1 clauses 1.6 and 1.7.

¹⁵⁸ *ISO 44001*, p.26 clause 8.6.8.

*and reduce waste.*¹⁵⁹ An environment that promotes collaboration and waste reduction needs to include a fully functioning system of collaborative relationship management. The Playbook emphasises the value of investing in and maintaining collaborative relationships and states that:

- *‘Acting together with suppliers drives mutual understanding and helps to solve problems more effectively, leading to better and faster delivery’*
- *‘Strategic supplier relationship management can unlock additional value and innovation’*
- *‘Contracting authorities should place significant importance on the relationships they create with their supply chains at an organisational and portfolio-level’*¹⁶⁰.

Collaborative relationship management should reach beyond the clients and suppliers and should include tier 2 and 3 supplier chain members. Although relationships with subcontracted supply chain members are managed primarily by suppliers, strategic supply chain relationships can also be developed through direct engagement led by clients.¹⁶¹

Commercial relationships should encourage teams to develop, share and apply information help to connect and should integrate the work of consultants, contractors, subcontractors, manufacturers and operators. In order to attract supplier commitments to innovative and successful solutions, it is important to make clear in the procurement process and in the contract the ways in which clients and suppliers can share these solutions for the benefit of other projects and programmes of work.

Collaborative relationship management depends on the project and programme managers, whether client officers or independent consultants, exercising their judgment fairly and constructively and taking an active approach in leading and coordinating:

- Outcome-based net zero strategies, procurement and incentivisation
- Environmental value improvement and risk management processes at strategic and project levels
- Consistent, proportionate and relevant performance measurement
- Collaborative decision-making and dispute avoidance.

¹⁵⁹ *Construction Playbook*, p.40.

¹⁶⁰ *Construction Playbook*, p.64.

¹⁶¹ *Constructing the Gold Standard*, p.90.

Framework review participants expressed concern that value improvement opportunities can be missed where performance measures:

- Are not outcome-based
- Are not applied transparently
- Are inconsistent or subjective
- Are used primarily to penalise suppliers rather than reward them
- Are not used as a basis to award further work
- Are not relevant to the client's required or desired outcomes
- Are not used for feedback to suppliers
- Are not used to drive continuous improvement¹⁶².

Where projects and programmes of work have the benefit of collaborative leadership and management, this can inspire suppliers and supply chain members to make additional efforts and to take on leadership roles in the achievement of net zero carbon targets.

7.6 How can early supply chain involvement help to achieve net zero targets?

The Construction Playbook mandates the use of '*early supply chain involvement*' (ESI) which '*extends the principle of early contractor involvement by formally engaging the tier 1 contractor alongside the tier 2 and 3 sub-contractors and suppliers in the pre-construction phase to input to the design (including the use of standards for products and interfaces), costing, risk management and structuring of a project or programme*'¹⁶³.

The Playbook recognises the benefits of ESI for the net zero carbon agenda, as illustrated in Figure 3, and requires that:

- '*Contracting authorities should require that solutions put forward by potential suppliers are accompanied by a whole life carbon assessment.*
- '*This should be conducted in collaboration with the wider supply chain, reflecting ways of minimising the GHG emissions across the life of the asset.*
- '*Whole life carbon assessments are expected to mature over time with higher-level assessments at the early engagement phase developing into robust assessments included in the final tender documentation*'¹⁶⁴.

¹⁶² *Constructing the Gold Standard*, p.62.

¹⁶³ *Construction Playbook*, p. 24.

¹⁶⁴ *Construction Playbook*, p. 23.

ESI enables evaluation and adoption of proposals for net zero targets and other sustainability initiatives at a time when they will have maximum impact, as illustrated in Figure 3. By inviting ESI proposals at a time when they can be assessed jointly, a project team can establish the full potential for significant reductions in environmental impact through:

- Proposals as to the most buildable and least wasteful interpretation of consultant designs
- Proposals in respect of reduced waste and increased recycling
- Proposals as to the efficient use of energy on site, including modern methods of construction such as off-site fabrication
- Proposals as to the efficient use of energy by reduced maintenance and repair in the operation of the built facility¹⁶⁵.

The Playbook states that ESI:

- *'will facilitate innovative, cost-effective solutions ensuring there is a major focus on social value and sustainability'*¹⁶⁶
- *is 'key to reducing end-to-end programme timescales, identifying opportunity and mitigating risk early and accessing the industry experts' knowledge and experience in all tiers of the supply chain early in the project or programme lifecycle'*¹⁶⁷.

ESI ensures that main contract and subcontract appointments are made early enough to secure the maximum net zero contributions from each team member, not by way of speculative optional extras but as important contributions to optimise project designs, sources of supply, methods of construction and other working practices. For example, ESI can enable the systematic joint analysis and validation of the net zero designs and specifications that each design consultant, contractor, subcontractor or supplier is being asked to warrant. Without this joint analysis and validation, a design warranty is not reliable.

The Construction Playbook is neutral as regards the contract forms that enable ESI, recommending the use of unamended JCT2016, NEC3, NEC4 and PPC2000/TAC-1 forms. As regards the integration of preconstruction services agreements with construction phase project contracts, the Playbook notes that the *'procurement process, evaluation approach and contract should generally be structured to cover both the ESI*

¹⁶⁵ *Collaborative Construction Procurement and Improved Value*, p.298.

¹⁶⁶ *Construction Playbook*, p.22.

¹⁶⁷ *Construction Playbook*, p. 22.

*and the construction phase. While it is possible to follow ESI with a further competitive procurement process, this can undermine the benefits of using ESI*¹⁶⁸

The government recommends the following procurement models that have been proven through a series of ‘*Trial Projects*’ to achieve improved efficiencies by using collaborative approaches that include ESI and in some cases building information modelling (‘*BIM*’):

- ‘*Two Stage Open Book*’, comprising the use of pre-construction phase conditional appointments of the team members as a means to encourage proposals for cost savings and improved value, within a stated budget, prior to confirming construction phase appointments¹⁶⁹
- ‘*Cost Led Procurement*’, comprising the use of a framework mini-competition as a means to encourage speculative proposals for savings and improved value, within stated cost ceiling, prior to team appointments¹⁷⁰
- ‘*Integrated Project Insurance*’ (‘*IPI*’) comprising appointment at outset of an alliance team to develop a delivery solution within a target budget and its commitment prior to construction to achieve the required outcomes, with the approved approach supported by a new latent defects and cost overrun insurance policy¹⁷¹.

ESI enables the cost and quality benefits of net zero/sustainable proposals to be thoroughly developed and assessed by the members of a team providing clients with the ‘*means to evaluate the cost of environmental issues and to balance this against their demonstrable benefits*’¹⁷². ESI also provides a means to work collaboratively with SMEs. The omission of tier 2 and 3 supply chain members and SMEs from ESI can result in significant missed opportunities for clients, and the Playbook comments that: ‘*SMEs are experts in their fields and can provide insight into MMC, innovative technologies and ways to minimise the GHG footprint of the proposed solutions across their whole lifecycle*’.¹⁷³

¹⁶⁸ *Construction Playbook*, p.24.

¹⁶⁹ *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration*

¹⁷⁰ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/991623/Guidance_on_adopting_and_applying_PPN_06_21_Selection_Criteria_3_.pdf.

¹⁷¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/326716/20140702_IPI_Guidance_3_July_2014.pdf.

¹⁷² *Turning the Corner*, Housing Forum, 2010, p.10.

¹⁷³ *Construction Playbook*, p.23.

A collaborative contract should be a handbook for the performance, management and integration of agreed ESI activities. ESI contracts should be created at a time when they can best support the early planning of projects and programmes of work and when they can help to reduce the risk of unforeseen events by fully integrating the work of team members. To coordinate and motivate the work of team members, ESI contracts should govern not only actions and payments but also rules and procedures for planning and mutual expectations as to the team members' behaviour.

7.7 How can supply chain collaboration help to achieve net zero targets?

Decarbonization of the supply chain is recognized as fundamental to tackling climate change. *Net-Zero Challenge: The supply chain opportunity* recognizes that:

- *'...beyond defining procurement standards, supply chain emission reductions often require more intensive supplier collaboration – to educate suppliers about decarbonization levers, provide technical advice, enable longer-term asset upgrades and cultivate continuous improvement'*
- *'...setting procurement standards for suppliers is one of the most powerful direct levers to address upstream emissions'*
- *'Strong standards link practices – such as a specific share and quality of renewable power, required levels of process efficiency or a required share of recycled materials – to procurement decisions'.¹⁷⁴*

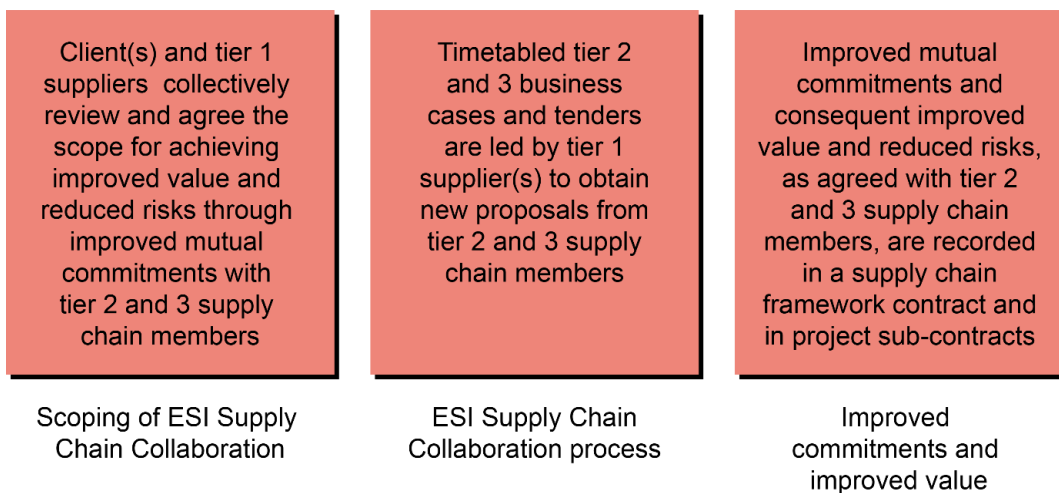


Figure 2: Structure of Supply Chain Collaboration

¹⁷⁴ *Net-Zero Challenge: The supply chain opportunity*, p. 30. https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf

'Supply Chain Collaboration' is a strategic approach to ESI¹⁷⁵. It requires a clear sequence whereby of agreed activities in accordance with a shared timetable. Supply Chain Collaboration can ensure that tier 1 suppliers take account of the particular benefits that local and regional supply chain members can offer in terms of cost, quality, and most importantly, net zero targets.¹⁷⁶ The structure of Supply Chain Collaboration is illustrated in Figure 2.

Trial Projects have shown how environmental initiatives can be combined with support for SME businesses, particularly where the scale of the program enables consistent procurement practices and where collaborative systems facilitate an exchange of ideas. Framework review participants commented that opportunities can fail to reach local and regional SMEs because tier 2 and 3 supply chains are established by tier 1 suppliers who have little knowledge of local or regional markets and capabilities¹⁷⁷. Supply Chain Collaboration can ensure that tier 1 suppliers take account of the particular benefits that local and regional supply chain members can offer in terms of cost, quality, sustainability and other relevant factors. Net zero benefits can include less energy used by local or regional companies in travelling shorter distances to construction sites.

The FAC-1 framework alliance contract¹⁷⁸ and the TAC-1 term alliance contract¹⁷⁹ both describe Supply Chain Collaboration as one of the collaborative systems through which all parties commit 'to reduce carbon emissions, to reduce use of energy and or natural and manmade resources, to improve waste management' and to take other measures to protect or improve the condition of the environment. These contract forms provide for the scoping and implementation of ESI at a strategic level and set out a clear sequence whereby alliance members undertake agreed activities in accordance with a shared timetable in order to:

- Review and compare the value offered by supply chain members
- Review the potential for more consistent, longer term, larger scale supply chain contracts and for other improved commitments and supply chain working practices

¹⁷⁵ *Project Procurement and Delivery Guidance Using Two Stage Open Book. and Supply Chain Collaboration.*

¹⁷⁶ *Constructing the Gold Standard*, p.59.

¹⁷⁷ *Constructing the Gold Standard*, p.59.

¹⁷⁸ <https://allianceforms.co.uk/about-fac-1/>

¹⁷⁹ <https://allianceforms.co.uk/about-tac>

<1/#:~:text=What%20is%20the%20TAC%2D1%20Term%20Alliance%20Contract%3F,value%20through%20building%20information%20modelling.>

- Jointly undertake enterprise planning by renegotiating or retendering supply chain contracts
- Agree more consistent, longer term, larger scale supply chain contracts and other improved supply chain commitments and working practices.¹⁸⁰

Supply Chain Collaboration enables the cost and quality benefits of sustainability proposals to be developed thoroughly and to be assessed by all team members. This provides clients, as noted by Housing Forum in ‘*Stopping Building Failures*’, with ‘*the means to evaluate the cost of environmental issues ...and to balance this against their demonstrable benefits*’¹⁸¹. The new lines of communication and the additional time created for joint working on UK Trial Projects led to team members offering new proposals for sustainable solutions that were practical and affordable within the client’s budget¹⁸².

7.8 How can framework alliances and term alliances deliver net zero targets?

Successful long-term strategic relationships require the support of procurement processes and contracts that are structured to obtain the full returns gained from improved environmental value. Frameworks provide a proven medium for long-term commitments between clients, managers and suppliers, enabling them to build successful relationships and to benefit from strategic relationship management.¹⁸³

The Construction Playbook describes how longer-term contracts should enable ‘*project and programme teams to identify potential opportunities and limitations in the market, take advantage of emerging technologies and innovations, and consider what actions would increase competition and improve market health*’¹⁸⁴. Frameworks can attract supplier innovations in relation to net zero carbon if their providers have a vision that is sufficiently clear and persuasive. With the motivation of a pipeline of work and a credible commercial strategy, frameworks provide opportunities for clients to seek innovative supplier proposals for net zero carbon at several points in the procurement process:

¹⁸⁰ FAC-1 clause 6.3 and TAC-1 clause 6.3.

¹⁸¹ *Stopping Building Failures*.

¹⁸² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/62628/Trial-Projects-July-2012.pdf

¹⁸³ *Constructing the Gold Standard*, pp. 11 and 12.

¹⁸⁴ *Construction Playbook*, p.10.

- When suppliers are seeking a place on the framework
- When suppliers are seeking appointment to a specific project or programme of work
- When suppliers are working collaboratively with clients and other suppliers, and also with tier 2 and 3 supply chain members, for the benefit of the framework as a whole¹⁸⁵.

Frameworks also enable the net zero carbon commitments of individual organisations to be integrated into coherent strategic plans. They provide systems for net zero carbon proposals and other sustainability initiatives to be carefully evaluated at a strategic level and then to be adopted consistently on successive projects.

Framework contracts can convert these net zero carbon objectives into actions by creating new lines of communication, new commitments and clear timescales for clients and industry to agree sustainable solutions that are practical and affordable. For example, frameworks can support a strategic approach to rapid and safe implementation of the retrofit programmes for existing housing and other public buildings that are essential to achieving net zero carbon targets.

Constructing West Midlands and North West Construction Hub report that they are *‘working with the Cambridge Centre for Smart Infrastructure & Construction in developing and piloting a challenging national construction industry carbon reduction code under the headings of:*

- **Water** - *To minimise and reduce potable water usage in construction and operational use.; consider embodied water in the manufacture of materials, works and services*
- **Waste** - *To minimise waste by reducing, reusing, recycling and recovering in the built environment, throughout the construction phase and across the supply chain; consider a circular economy approach diverting waste from landfill*
- **Materials** - *To identify, source and use environmentally and socially responsible materials; consider health and safety requirements and other ways to promote well-being for construction workers and future building-users such as eliminating hazardous materials*

¹⁸⁵ *Constructing the Gold Standard*, p.58.

- **Biodiversity and ecology** - *To protect and improve flora, fauna and habitat and provide ecological benefits throughout the project lifecycle*
- **Land, air, water, noise** - *To maximise positive, and minimise negative effects on land, air, water, noise, throughout the construction delivery phase and to provide a lasting legacy*
- **Supporting communities** - *To consider the environmental impact on the community, and to get involved with and establish how a project can provide benefits and improve the area*
- **Transport and mobility** - *To consider opportunities for sustainable transport of labour and materials throughout the construction delivery phase and to consider opportunities to prioritise walking, cycling and public transport usage*
- **Climate change mitigation and adaption** - *To minimise greenhouse gases emitted in the built environment, the construction process and in the manufacture/delivery of associated goods, works, services; consider and maintain flexibility in design and construction processes and delivery methodologies to cater for future climate change adaption; reduce operational energy demand (before offsetting); reduce embodied carbon (before offsetting)'.¹⁸⁶*

Through strategic collaboration among framework providers, clients, managers and suppliers, the proposals designed to achieve net zero carbon targets and other sustainability initiatives can be assessed and costed objectively for adoption on framework projects. Frameworks also support joint net zero carbon initiatives by sharing access to the systematic use of digital information, MMC and SME expertise, particularly where the scale of a framework programme enables consistent supply chain procurement and where collaborative framework systems are used to facilitate the exchange of ideas.

The Construction Playbook recommends that alliancing arrangements *'should be considered on more complex programmes of work as the effective alignment of commercial objectives is likely to improve intended outcomes as well as drive greater value for money'*¹⁸⁷ The Infrastructure Client Group's *'Alliancing Best Practice in*

¹⁸⁶ *Constructing the Gold Standard*, pp. 20 and 21.

¹⁸⁷ *Construction Playbook*, p.41.

Infrastructure Delivery’ describes an alliance as ‘an arrangement where a collaborative and integrated team is brought together from across the extended supply chain. The team shares a set of common goals which meet client requirements and work under common incentives’¹⁸⁸.

The Construction Playbook acknowledges the potential of the FAC-1 framework alliance contract in delivering improved value and states that: ‘A successful framework contract should be based around principles that align objectives, success measures, targets and incentives so as to enable joint work on improving value and reducing risk. This should then be combined with transparent performance measurement and work allocation procedures. The FAC-1 framework is a good example of a standard form framework contract that can achieve this and many of the ambitions set out in this Playbook’.¹⁸⁹ The structure of FAC-1 is illustrated in Figure 5.

FAC-1 contains a definition of sustainability as ‘measures intended to reduce carbon emissions, to reduce use of energy and or natural and manmade resources, to improve waste management, to improve employment and training opportunities and otherwise to protect or improve the condition of the Environment or the well-being of people’¹⁹⁰. The contractual machinery set out in FAC-1 includes working with supply chain members in order to seek improved value in exchange for improved mutual commitments.¹⁹¹

The collaborative procurement of UK infrastructure projects and programmes is supported by the initiative known as ‘Project 13’, which seeks ‘to develop a new business model – based on an enterprise, not on traditional transactional arrangements – to boost certainty and productivity in delivery, improve whole life outcomes in operation and support a more sustainable, innovative, highly skilled industry’.¹⁹² The Construction Playbook notes how the Crown Commercial Service framework alliances are ‘integrating FAC-1 and Project 13 principles’¹⁹³.

¹⁸⁸ *Alliancing Best Practice in Infrastructure Delivery*, 2014 , Infrastructure Client Group p. 5
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/359853/Alliancing_Best_Practice.pdf

¹⁸⁹ *Construction Playbook*, p.42.

¹⁹⁰ FAC-1 Appendix 1.

¹⁹¹ FAC-1 clause 6.

¹⁹² <https://www.project13.info/about-project13/>

¹⁹³ *Construction Playbook*, p.27

FAC-1 framework alliance contracts are already being used by a wide range of public and private sector clients such as Crown Commercial Service, NHS Shared Business Services, Kier Construction, the Football Foundation, LHC and Ministry of Justice¹⁹⁴. Term alliances also provide a proven collaborative model for long-term contractual relationships through which the parties can achieve improved environmental value in relation to a wide range of asset management activities¹⁹⁵. A term alliance governs the issue of orders for services, works or supplies over an agreed period of time and the potential duration of a term alliance offers scope:

- For the development of collaborative systems that recognise agreed net zero objectives
- For the parties to agree joint and individual activities that improve the prospect of achieving those net zero objectives
- For the measurement of success according to agreed net zero targets.

Crown Commercial Service reports that *'The FAC-1 Framework Alliance Contract enables the government to align its strategies in construction with the key objective policies outlined in the Construction Playbook. The benefits of this drive improvements across the construction industry including:*

- *Ability to influence design through earlier contractor engagement*
- *Connecting whole life considerations through an integrated supply chain*
- *Focus on newer and safer working practices in construction*
- *Options for innovative construction methods and technologies*
- *More opportunities for SMEs, specialists and local providers*
- *Sustainable solutions and environmental benefits'*.¹⁹⁶

Term alliances also enable the integration of these activities with capital projects so as to establish a whole life approach to procurement, for example using the TAC-1 term alliance contract form. If a term alliance governs a combination of planned, responsive, and cyclical tasks, it is particularly valuable as a procurement model for integrated and collaborative asset management through which:

¹⁹⁴ *Constructing the Gold Standard*, p. 28 and Annex 2.

¹⁹⁵ <https://allianceforms.co.uk/about-tac-1/#:~:text=What%20is%20the%20TAC%2D1%20Term%20Alliance%20Contract%3F,value%20through%20building%20information%20modelling>

¹⁹⁶ *Constructing the Gold Standard*, p. 28.

- Capital improvements can reduce responsive and cyclical net zero carbon emissions
- Repair and maintenance can reduce net zero carbon emissions caused by the failure of project components and can avoid or delay the need for additional capital expenditure.

A successful whole life approach to asset management depends on creating interfaces between the capital works team and the operation, repair and maintenance team. These interfaces give rise to provisions that should appear in collaborative construction contracts and should be mirrored in related term alliance contracts:

- Suitable intellectual property rights licences in respect of BIM models and other design documents that enable the operation, repair and maintenance team to access and use all available asset information
- A clear interface between the defects liability obligations of the capital works team and commencement of the obligations of the operation, repair and maintenance team, with clarification as to who responds to notification of a problem and at whose expense
- An understanding of all exclusions and limitations in the liability of the design and construction team, including all specialist subcontractors, suppliers and manufacturers, so that it is clear where the operation, repair and maintenance team must step in to avoid leaving any gaps in the service
- Availability to the operation, repair and maintenance team of information regarding plant and equipment warranties, including the terms and conditions of those warranties, so that the operation, repair and maintenance team do not invalidate them through any act or omission
- A clear understanding of the specific obligations of the operation, repair and maintenance team in relation to warranted plant and equipment
- Clarity as to the liability of the capital works team, including subcontractors, suppliers and manufacturers, in the event of an error or omission by the operation, repair and maintenance team¹⁹⁷.

A framework alliance contract or term alliance contract can create and embed fair and open systems for delivering improved environmental value through:

- Shared objectives, success measures, targets and incentives
- Systems through which alliance members build up and manage shared information in relation to net zero solutions, including design, time, cost and operational data

¹⁹⁷ *Collaborative Construction Procurement and Improved Value*, p.87.

- Agreed activities through which alliance members work together to improve environmental value
- Clear timeframes and deadlines for the alliance members' activities, responses and approvals
- Joint systems for joint management of risk and the agreed avoidance and resolution of disputes.

Long-term strategic relationships under a framework alliance or term alliance enable teams to obtain the best results from early supply chain involvement, to develop mutual confidence and to share information that will enhance project outcomes.

7.9 How can the procurement of MMC tackle climate change?

Modern methods of construction ('MMC') encompass off-site, near site and on-site pre-manufacturing and have the potential to speed up delivery, reduce cost, improve quality and importantly, reduce waste and reduce carbon emissions.¹⁹⁸. A range of MMC approaches is set out in Figure 3 and the House of Lords Science and Technology Select Committee reported that the benefits of MMC include:

- *'Better quality*
- *Enhanced client experience*
- *Fewer labourers and increased productivity*
- *More regional jobs away from large conurbations*
- *Improved health and safety for workers*
- *Ensure buildings meet quality assurance standards*
- *Improved sustainability*
- *Reduced disruption to the local community during construction*¹⁹⁹.

The Construction Playbook emphasises how MMC '*can deliver efficiencies and higher quality and safer solutions with lower GHG emissions quicker than traditional construction methods*'²⁰⁰. It emphasises the potential of MMC and '*product platforms comprising of standardised and interoperable components and assemblies*'.²⁰¹ The Playbook requires clients to collaborate in finding opportunities for cross-sector platform solutions and it states that '*procurements and frameworks should support*

¹⁹⁸ *Construction industry must harness Covid spirit and MMC to reach net zero*, Brayshaw, V. <https://www.newcivilengineer.com/innovative-thinking/construction-industry-must-harness-covid-spirit-and-mmc-to-reach-net-zero-16-06-2021/>

¹⁹⁹ *Offsite manufacture for construction: Building for Change*, House of Lords Science and Technology Select Committee, <https://publications.parliament.uk/pa/ld201719/ldselect/ldsctech/169/169.pdf>

²⁰⁰ *Construction Playbook*, p.18.

²⁰¹ *Construction Playbook*, p.21.

this'.²⁰² It also recognises the potential for 'greener solutions as a result of an increase in manufacturing approaches'.²⁰³

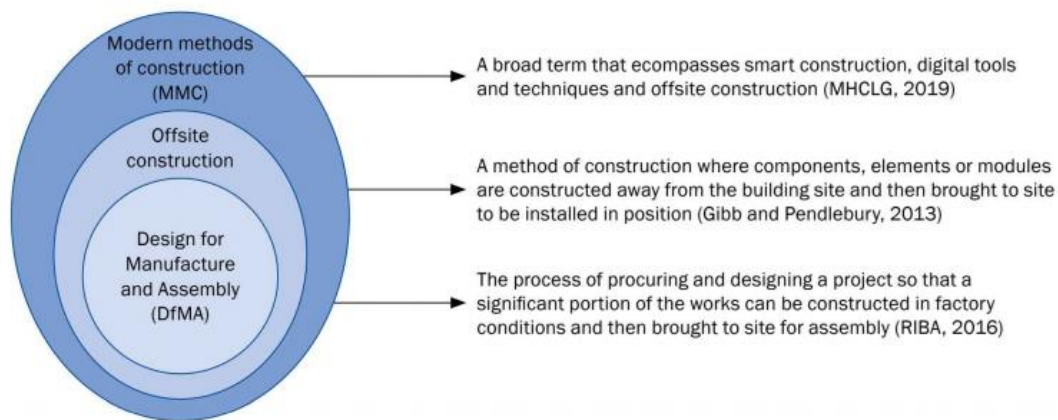


Figure 3: Approaches to MMC²⁰⁴

The Playbook states that:

- *'We need to change the way we procure construction to support investment in MMC and skills*
- *Adopting longer term contracting is one way of achieving this, but however we contract across our portfolios of public works, we need to actively consider how we can maximise the use of MMC.*
- *Contracting authorities should develop a comprehensive strategy at an organisational level.*
- *This should run through their portfolios and down to individual projects and programmes.*
- *MMC is not an end in itself and contracting authorities should consider whether, how and to what extent the use of MMC can drive wider value and achieve the project or programme outcomes.*²⁰⁵

Modern methods of construction offer powerful vehicles for the industry to drive improved productivity, processes and energy efficiency, and to reduce environmental

²⁰² *Construction Playbook*, p. 20.

²⁰³ *Construction Playbook*, p. 19.

²⁰⁴ *Methodology for quantifying the benefits of offsite construction*, Janson Van Vuuren, T, Middleton, 2020, C792, CIRIA, London, UK (ISBN: 978-0-86017-897-2) www.ciria.org

²⁰⁵ *Construction Playbook*, p.18.

impact and waste. They represent efficient means to reduce carbon emissions²⁰⁶ but their adoption depends on procurement strategies that attract the investment in innovations and that gain maximum advantages from MMC technologies.

The National Audit Office (NAO) Report, ‘Using Modern methods of construction to build homes more quickly and efficiently’, presented a case for MMC which resonates with reduction of the construction carbon footprint, stating that:

- It should be possible to build up to four times as many homes with the same on-site labour.
- On-site construction time can be reduced by over a half.²⁰⁷

If carbon impact relating to the production and construction stages of a built asset can account for half of a new building’s whole life carbon impact²⁰⁸, then the emissions highlighted in Figure 4 can be significantly reduced by moving away from traditional site-based construction towards the adoption of MMC.

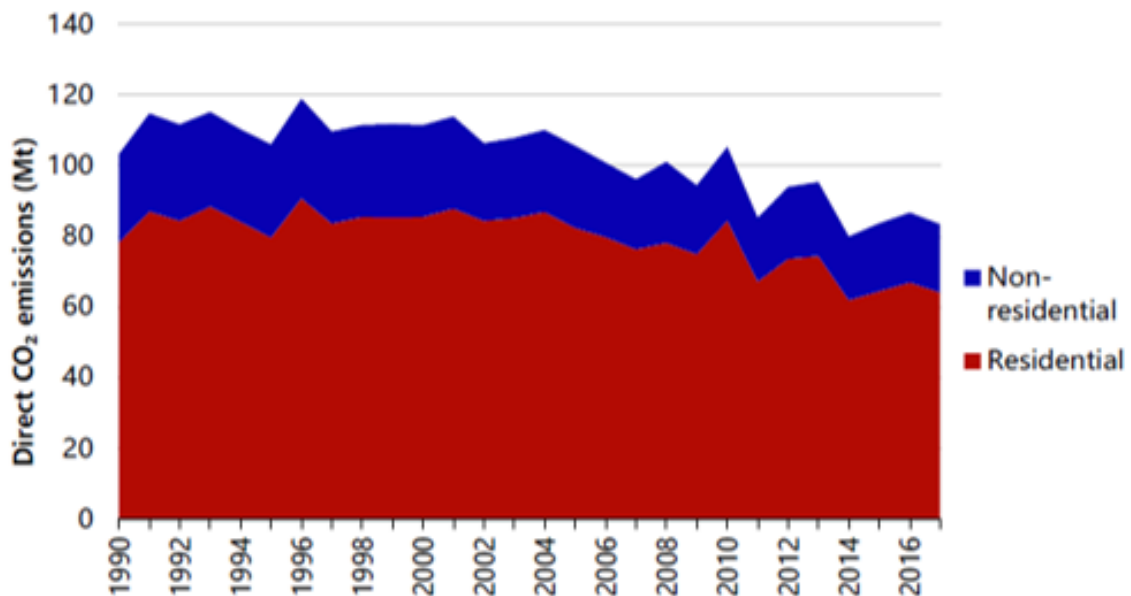


Figure 4: Building Sector direct CO2 emissions²⁰⁹

²⁰⁶Benefits of Modern Methods of Construction, Whiteman, S., <https://www.fgould.com/uk-europe/articles/benefits-of-modern-methods-of-construction/>

²⁰⁷ National Audit Office 2005 <https://www.nao.org.uk/wp-content/uploads/2005/11/mmc.pdf>

²⁰⁸ UK GBC report April 2019 <https://www.ukgbc.org/ukgbc-work/net-zero-carbon-buildings-a-framework-definition/>

²⁰⁹ Committee on Climate Change, May 2019 <http://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf>

Savills forecast that the percentage of new built homes using MMC will rise from 8% in 2020 to 20% by 2030²¹⁰. They indicate that the factors driving the adoption of MMC include the cost and availability of labour, housing supply shortages and regulatory or governmental intervention.

The innovations and efficiencies through which MMC can reduce carbon emissions depend on the strength and stability of the relationships that clients and suppliers create. The Construction Playbook states that *‘Projects and programmes should engage in innovative thinking from the start through early engagement. Research and innovation-based procedures which go beyond engagement to inviting the market to suggest novel solutions to problems should also be considered’*²¹¹.

King’s College London Centre of Construction Law²¹² was commissioned by the UK Construction Industry Council to undertake research aimed at creating new commercial models which support the long-term strategic relationships designed to govern the procurement of MMC housing. Research outputs reinforced the need for long-term strategic relationships embedded in contracts which integrate design, construction and operation contracts, and which support and stimulate *‘new sustainability initiatives’* linked to:

- Supply chain initiatives for offsite and modular construction
- Early contractor involvement and supply chain collaboration
- Consortium procurement by multiple housing clients
- Delivery of social value through strategic procurement including local/regional/SME tier 1/2/3 supply chain opportunities and employment/skills commitments
- Performance/innovation to improve driven by value and KPIs
- Behaviours which build relationships, and which create a working environment to deliver innovation, investment in capacity, improved quality and reduced cost
- Long-term strategic partnerships in housing procurement programmes²¹³.

²¹⁰ *Spotlight: Modern Methods of Construction*, Savills 2020, https://www.savills.co.uk/research_articles/229130/301059-0/spotlight--modern-methods-of-construction

²¹¹ *Construction Playbook*, p. 23.

²¹² <https://www.kcl.ac.uk/construction-law>

²¹³ *Research Report and Draft Model Forms for Long Term Strategic Relationships*, King’s College London Centre of Construction Law for Construction Leadership Council, <https://www.kcl.ac.uk/construction-law/activity>.

Modular construction, offsite fabrication and other MMC solutions depend on factory production lines, and these in turn require the long-term commitments that are created by an alliance. The Construction Playbook recognises that portfolios and longer-term contracting ‘will give the industry the certainty required and make it commercially viable for suppliers to invest in innovative new technologies and MMC’, provided that contracting authorities demonstrate this ‘does not come at the expense of an innovative and competitive market’.²¹⁴

MMC solutions also depend on the early involvement of manufacturers, and this can be established through a system of Supply Chain Collaboration. Long-term alliance contracts enabling investments in MMC are being used by clients such as Crown Commercial Service, LHC and the National Housing Federation²¹⁵ as well as by numerous housing associations and local authority clients²¹⁶.

The September 2020 report ‘Build Homes, Build Jobs, Build Innovation – A Blueprint for a Housing Industrial Strategy’ explains how ‘more innovative and progressive contracts reflect earlier and closer engagement with manufacturers, for instance the ACA Framework Alliance Contract (FAC 1) for long-term strategic relationships enabling one or more clients to integrate housing programmes that are delivered through smart construction linked to separate design, construction and operation contracts’²¹⁷. The same report recognises the value of long-term contractual commitments under a TAC-1 term alliance contract where this approach was adopted by the Royal Borough of Greenwich and Ideal Modular²¹⁸.

7.10 How does digital technology tackle climate change?

Digitalising the design, construction and operation of a built asset enables the added value of capturing and retaining the ‘golden thread of information’ across its lifecycle which can improve environmental value. For example, BIM allows a team to validate information, to coordinate professional contributions and to build a ‘digital twin’ before entering the construction site, and potential benefits or net zero carbon include

²¹⁴ Construction Playbook, p.11.

²¹⁵ Research Report and Draft Model Forms for Long Term Strategic Relationships.

²¹⁶ <https://allianceforms.co.uk/> News and Users.

²¹⁷ Build Homes, Build Jobs, Build Innovation, September 2020, p. 34 De’Ath, M and Farmer, M <https://www.hta.co.uk/storage/app/media/build-homes-build-jobs-build-innovation.pdf>

²¹⁸ Build Homes, Build Jobs, Build Innovation, p. 34.

simulation, control, monitoring and predictability.²¹⁹ BIM also facilitates accessibility, coordination and updating of project information throughout the lifecycle of an asset. The potential application of BIM to the whole life of a project is illustrated in Figure 5.

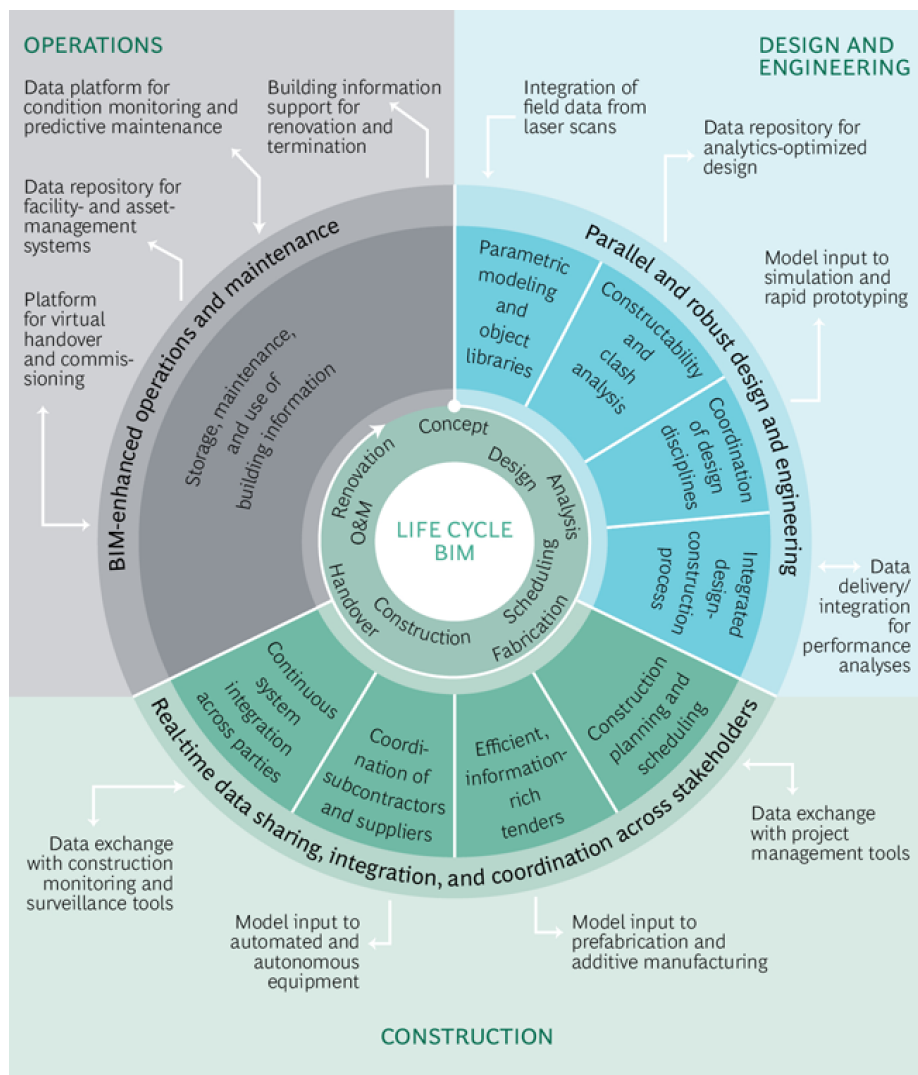


Figure 5: Application of BIM to the life cycle of an asset²²⁰

Most importantly for net zero carbon targets, BIM enables more effective decisions through early and more comprehensive development of sustainable designs. Reduction

²¹⁹ *Towards a semantic Construction Digital Twin: Directions for future research*, Boje, C. et al, Automation in Construction 114 (2020) 103179.

²²⁰ *The Transformative Power of Building Information Modelling*, Boston Consulting Group, <https://www.bcg.com/en-gb/publications/2016/engineered-products-infrastructure-digital-transformative-power-building-information-modeling>

of carbon emissions depends on the ability to undertake complex performance analysis focusing on environmentally low-impact design. For example, early design decisions can reduce a building's energy consumption by 80%²²¹ by optimizing orientation, building shape, size, insulation and ventilation.²²² Empirical studies have recognized ways of using BIM with energy modelling, as a design tool that employs an iterative design process in conjunction with feedback from the energy model in order to develop energy-efficient designs.²²³

The environmental benefits of digital technology also extend to the operational phase of a built asset, so that relevant information captured as part of the design and construction phases can support interactive operation, repair and maintenance by informing the development and use of an 'Asset Information Model'²²⁴. An initiative to use BIM as a means to integrate the capital and operational phases of a project has been highlighted in the UK Government's 'Soft Landings' programme which:

- *'can play an important part in enabling a smooth transition from construction to operation*
- *'also helps clients to assure the performance of an asset and inform future project performance setting'*
- *'is also fundamental to maintaining the "golden thread" of a facility's purpose by aligning the interests of those who commission, design and construct with those who use and maintain'.*²²⁵

The closer integration of the design, construction and operational phases in the life of a built asset forms part of the ISO 19650 suite of standards.²²⁶ The development of effective building energy and environmental assessment tools and practices is crucial to ensure efficient design and operation²²⁷. The need for reliable results in the early stages of design requires integration with existing design tools and methods²²⁸. To fulfil

²²¹ *Energy Efficiency in Buildings, Transforming the Market*, 2009. <https://docs.wbcsd.org/2009/08/EEB-TransformingTheMarket.pdf>

²²² *Promotion of New Technologies to foster SPP* Vornicu, R.- Example of BMI in construction sector, published in Andhov, M., Caranta, R., Stoffel, T., Grandia, J., Janssen, W. A., Vornicu, R., ... Wiesbrock, A. (2020)- *Sustainability through public procurement: the way forward – Reform Proposals*

²²³ *Critical review of BIM-based LCA method to buildings*, Soust-Verdaguer, B. et al in *Energy and Buildings* Volume 136, 1 February 2017, Pages 110-120.

²²⁴ *ISO 19650-1*, clause 3.3.9.

²²⁵ file:///C:/Users/K1217231/AppData/Local/Temp/GSL_Report_PrintVersion.pdf

²²⁶ *ISO 19650-1*.

²²⁷ *Green BIM – How Building Information Modelling is contributing to green design and construction*, Smart Market Report 2010, McGraw-Hill Construction, Bedford.

²²⁸ *Building Information Modelling (BIM) for green buildings: A critical review and future directions*, Y. Lu, Z. Wu, R. Chang, and Y. Li, 2017. *Automation in Construction*.

the operational potential of BIM data depends on the adoption of procurement models that invite the market to submit whole life asset management proposals. A digital '*life cycle assessment*' can set out the method of measuring environmental performance and can lead to a more interoperable and open access to data, which can be used during the different phases of the building's life to empower collaborative decision-making.

Digital tools can assist professionals in addressing whole life carbon assessments of the built environment at different stages in the procurement process. In order to influence the environmental impact of a project, this analysis will need to be ongoing and commence from the early stages of an asset²²⁹. The first assessment should take place as early as concept design (RIBA Stage 2 or equivalent) and as a minimum before the commencement of technical design (RIBA Stage 4 or equivalent). This ensures the assessment has the greatest potential to drive carbon reductions in all future stages of the project's delivery. A further assessment should be undertaken at practical completion (end of RIBA stage 5) which should measure the as-built outcome, against modelled assumptions. This final as-built assessment should be used to determine the extent of carbon impacts and emissions needing to be offset to achieve net zero carbon of construction.

Digital technology improves the ability of a team to create new connections between its members and to integrate the capital and operational phases of its projects. However, the use of digital technology is not a substitute for effective procurement strategies and processes or for collaborative contracts and relationship management. BIM requires a collaborative procurement platform in order to accomplish the efficiency and productivity that it is designed to deliver. The collaborative use of ESI, Supply Chain Collaboration and alliances are necessary in order for BIM to integrate client briefs and consultant designs with contributions from main contractors, subcontractors, suppliers, manufacturers and operators.

Research undertaken by King's in 2016 found that, on studying early adopters of BIM, demonstrated that effective use of BIM was optimised through the adoption of collaborative procurement models:

- Bringing all BIM contributors into the project delivery team at the optimum time
- Using BIM to build confidence in and reliance on shared information
- Considering the operational impact of the built asset through the application of BIM on those who operate, repair and maintain the completed capital project

²²⁹ HM Treasury, Green Construction Board, <https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2016/10/GCB-3YO-report-v11-final-PDF.pdf>

- Creating a set of contracts which clearly defined and integrated all the team members' roles and responsibilities.²³⁰:

It is an error to assume that BIM or any digital medium automatically improves communication, or that digital technology is a substitute for collaborative construction procurement. To try to implement one without the other is a serious missed opportunity, and commentators have suggested that:

- *'What partnering needed to succeed was BIM and this risk-managing collaboration concept will probably return to favour in supply chain relationships'*²³¹
- *'The industry's route map to collaboration and high-efficiency new delivery models can only be underpinned by BIM and the importance of its adoption cannot be overestimated'*²³²
- *'Establishing a 'single source of truth' on projects for monitoring projects early, potentially supported by collaborative technology, helps to minimize misalignments and enable corrective action'*²³³

Perceived threats to intellectual property rights are seen as a serious obstacle to collaborative innovation through BIM, because suppliers and supply chain members are concerned that they will lose control of their original net zero carbon ideas. Collaborative contracts can help to avoid this roadblock by making clear:

- Mutual intellectual property ownership rights and protections between clients, managers and suppliers in respect of their contributions to BIM models and other digital information
- The grant of mutual limited, non-exclusive intellectual property licences to reproduce, distribute, display or otherwise use those contributions
- The requirement for back-to-back arrangements between suppliers and supply chain members.

The ISO 19650 suite states that *'Collaboration between the participants involved in construction projects and in asset management is pivotal to the efficient delivery and operation of assets'*²³⁴ and requiring the use of collaborative tools in relation to

²³⁰ *Enabling BIM through Procurement and Contracts.*

²³¹ *Growth Through BIM*, Saxon, R., 2013, 5.27.

²³² *Modernise or Die*, p.36.

²³³ *Reinventing Construction Through a Productivity Revolution.*

²³⁴ *ISO 19650:1*, p. vi.

'procurement routes and appointment arrangements'.²³⁵ The future of BIM outlined in the BIM 2050²³⁶ report predicted that *'design consultants and principal contractors will be appointed simultaneously, early in the life cycle, to enable concurrent working at outline business case stage'*²³⁷. To achieve this objective, BIM needs to be more closely connected to integrated procurement models and alliance contracting systems.

There is a natural fit between digital technologies and the contractual systems governing ESI and Supply Chain Collaboration. Whether in a single project or programme of works, effective collaborative contractual mechanisms should describe how digital technologies are enabled and supported through specific provisions governing:

- The impact of digital information on the timing of agreed activities
- Mutual intellectual property rights among clients, advisers, suppliers and supply chain members
- Reliance on digital information by clients, advisers and suppliers
- Responsibility for managing digital information
- Links between the digital information used for the design, construction and operation of projects and programmes of work.

Other digital tools can promote the efficiencies required to achieve net zero carbon targets both at the capital expenditure stage of a project and in its operational lifecycle. The monitoring of a building's performance and efficiency is now possible with the application of the *'Internet of Things'*.²³⁸ The use of *'Artificial Intelligence'* has been valuable in terms of its ability to digest huge volumes of data, identify patterns and enhance the ability to learn²³⁹. The application of *'smart contracts'* creates the ability to implement automatic supply transactions²⁴⁰.

The traceability of information has emerged as a key requirement in securing sustainable sources of supply. Relevant technologies include *'Distributed Ledger*

²³⁵<https://www.cdbb.cam.ac.uk/Resources/ResoucePublications/InformationManagementaccordingtoBSENISO19650GuidancePart1Concepts.pdf> page 15.

²³⁶ *Built Environment 2050 A report on our digital future*, CIC, <http://www.cic.org.uk/download.php?f=be2050-cic-bim2050-2014-1.pdf>

²³⁷ *Built Environment 2050 A report on our digital future*, p. 23.

²³⁸ <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>

²³⁹ https://www.ibm.com/cloud/learn/what-is-artificial-intelligence?mhsrch=ibmsearch_a&mhq=Artificial%20Intelligence

²⁴⁰ https://www.ibm.com/topics/smart-contracts?mhsrch=ibmsearch_a&mhq=smart%20contracts

Technology'²⁴¹ which enables a decentralized digital database that stores information in a secure and accurate manner and enables the simultaneous sharing and updating of records. '*Blockchain*' is a Distributed Ledger Technology which tracks and stores information from all supply chain members and which can create more reliable information as to the sourcing of supplies. Blockchain technology is designed to assess transactions, either rejecting them as invalid or committing them to its immutable record by the clearly defined rules. It can deliver transparent and traceable records which can track the movement of goods, determine the authenticity of a product and enable quality assurance that supports net zero carbon targets.

Strategic commitments to digital technologies can be improved through direct contractual relationships between clients, managers and suppliers under collaborative contracts which:

- Ensure stronger commitment to shared net zero objectives and collective self-regulation, as well as to improved transparency and efficiency, creating the ability to share digital information on mutually agreed terms
- Enable collective decision-making so that the net zero outcomes from the digital technologies used on different projects are drawn together and applied more effectively
- Enable value-adding digital activities and processes, stating who works with whom and at what level of responsibility
- Clarify the whole life operational impact of digital information on the repair, maintenance and operation of completed framework projects²⁴².

The Playbook integrates support for BIM with a focus on whole life performance, and it requires that '*where appropriate, contracts should be written to include clear expectations for completion, maintenance and transition arrangements*', with '*a clear understanding of how maintenance will be managed in a timely and efficient manner as set out in the contract*'²⁴³.

²⁴¹ *Distributed Ledger Technology- Beyond Blockchain*,
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

²⁴² *Constructing the Gold Standard*, p.52.

²⁴³ *Construction Playbook*, p.69.

7.11 How can collaborative management deliver net zero?

Encouraging an industry with an adversarial mindset to focus on improved value, long term relationships rather than the ‘*race to the bottom*’ is challenging but Trial Projects and other case studies have demonstrated how this is possible. Trial Projects include the results that collaborative management can deliver when it comes to energy-efficient built assets.

For example, the ConnectPlus M25 reported how ‘*improvements to the design were identified that reduced whole life costs and improved the long-term reliability of the works. Such improvements included rationalisation of bolt sizes, improvements to the noise-damping systems and additional packing to base plates.*’²⁴⁴ Connect Plus created and implemented an innovative ‘*Sustainable Business Culture Model*’ through which it had created integrated teams, delivering a highways asset management programme in an efficient and collaborative manner under Two Stage Open Book²⁴⁵ within a 30-year concession awarded by the Highways Agency (former Highways England, now National Highways²⁴⁶). This project combined Supply Chain Collaboration with cultural change to align and integrate the client with the first, second and third-tier supply chain members, which enabled transparency, innovation and joint risk management.

Another project showing the environmentally relevant results delivered by collaborative leadership and management techniques was a £30 million school in Hackney London which used collaborative procurement and contractual Supply Chain Collaboration to focus on improved sustainability. The project included a ground source heat pump and photovoltaic panels. The team reported ‘*a strong partnering ethos through client leadership ... by the City of London Corporation, supporting the team in meeting significant time and cost challenges*’, ‘*maximum engagement with stakeholders, including staff and pupils, at all stages of the project*’, and ‘*collective team contributions to sustainability improvements, with maximum use of natural light and energy-saving techniques.*’²⁴⁷

²⁴⁴ *Construction Playbook*, p.69.

²⁴⁵ *Construction Playbook* pp. 22- 27; *Project Procurement and Delivery Guidance using Two Stage Open Book and Supply Chain Collaboration*.

²⁴⁶ <https://www.gov.uk/government/organisations/highways-england>.

²⁴⁷ *10 Years of Partnering Contracts*, Association of Consultant Architects, 2010, 20: <file:///C:/Users/K1217231/AppData/Local/Temp/10-Year-Anniversary-PPC-and-5-Year-TPC.pdf> ‘The project won the Excellence in Building Schools for the Future Award 2009 for ‘Innovation and Student

In the housing sector it has been recognised that *‘The 29 million existing homes across the UK must be made low carbon, low-energy and resilient to a changing climate. This is a UK infrastructure priority and should be supported as such by HM Treasury.’*²⁴⁸ These objectives can be delivered through the collaborative procurement and management techniques illustrated by the SCMG Trial Project. The SCMG relationships and structures were sustained by training and support to embed a collaborative culture. The agreed use of Two Stage Open Book with programmed systems of Supply Chain Collaboration incorporated contractual processes for joint working with suppliers and subcontractors. The qualitative, sustainable benefits of this approach contributed to net-zero objectives and included:

- *‘Subcontractor/supplier innovations in proposed new materials and development of specifications, such as future-proofing green roofs at no additional cost and upgrading windows from Grade C to Grade A at no additional cost;*
- *Improved quality control through manufacturers attendance on site*
- *Improved repairs and maintenance through, for example, self-cleaning glass on high-rise blocks*
- *More sustainable solutions, including exterior wall insulations’.*²⁴⁹

Another relevant case study is provided by the Anglian Water @one alliance which used collaborative client leadership to enable a 50% reduction in embodied carbon. The @one Alliance case study demonstrated how *‘collaborative and integrated teams have pooled their combined expertise and their broader partner capability to deliver innovative solutions and have been driven to meet what at first sight looked an unlikely target’.*²⁵⁰

Engagement’. The pupils described it as ‘the best school ever’, and it also won the Constructing Excellence 2010 London and South-East Award for ‘Integration and Collaborative Working’. See more in *Collaborative Construction Procurement and Improved Value*.

²⁴⁸ <https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/>

²⁴⁹ *SCMG Trial Project* case study.

²⁵⁰ *Alliancing Best Practice in Infrastructure Delivery*, p.13: ‘As an example, the expansion of the Bedford Water Recycling Centre would traditionally have been delivered with extra capacity being built on new sections of the site. However, these would have failed the carbon and cost targets. Following collaborations across the home organizations and the supply chain and close joint development of the solution with the operational team, two new processes were retrofitted to existing civil assets. This led to reduced costs and carbon and a solution the operations team were able to manage and maintain from day one’ ; *Collaborative Construction Procurement and Improved Value*.

SCF²⁵¹ and its contractors are also committed to supporting clients with responding to the climate emergency and reducing the carbon footprint of their buildings. SCF's Climate Emergency Response Group (CERG), a collection of contractor representatives with expertise in carbon reduction and sustainability, monitors developments in legislation and best practice and makes recommendations for how, as integrated project teams, we can best respond to the climate emergency.

Firstly, the SCF group are developing a Client Advisory Tool, which will be utilised as early as possible for both newbuild and retrofit projects to SCF Clients, Consultants, Contractors and Supply Chain partners to provide guidelines and information on definitions, drivers and methodology associated with Net Zero Carbon and the construction industry. It will also provide guidance on some key suggestions to reduce or further reduce carbon emissions through the design stages.

Secondly, SCF have secured a commitment from all their contractors to undertake a Baseline Carbon Assessment following appointment on each project. This will not mandate full carbon life cycle modelling on all projects but provide a high-level assessment to inform early-stage discussions regarding the likely carbon footprint of the project as it is currently or likely to be designed. The contractor will present the assessment results accompanied by advice and improvement options for consideration by the client. Complimenting this, we are looking to develop a benchmark carbon value to be inserted into the Cost Time Benefits form to benchmark improvements through the project gateways.

The evolving nature of carbon reduction measurements, technologies and methodologies will be reflected in the Client Advisory Tool through regular reviews by the expert main contractor sustainability professionals, and analysing data produced through the Cost Time Benefits form. By taking this initial step towards informing, guiding, measuring and reviewing carbon emissions through their projects, SCF hope to support project decision-makers toward a more sustainable built environment.

8 Collaborative procurement and building safety

The research team has focused on the impact of collaborative procurement in dealing with problems of building safety, based on the recommendations in Dame Judith Hackitt's 2018 Independent Review following the Grenfell Tower disaster that:

²⁵¹ <https://scfconstruct.org.uk/9210-2/>

- *‘tackling poor procurement practices ... to drive the right behaviours to make sure that high-safety, low-risk options are prioritised and full life cycle cost is considered when a building is procured.’*²⁵²
- *‘The invitation to tender and the bid process must prioritise building safety and balance the upfront capital cost against quality and effectiveness. The safety requirements must be effectively tested during both the tendering process and the bid review.’*²⁵³

8.1 How can collaborative procurement avoid a race to the bottom?

An arm’s length single-stage, fixed price tender often drives inappropriate behaviours and encourages a focus on providing the minimum standard of materials and workmanship necessary to achieve the stipulated specification, the *‘race to the bottom’* as emphasized in Dame Judith Hackitt’s Independent Review. Problems in the construction industry by way of unpredictable outturn costs, delays and defects can often be traced to a single-stage, fixed price procurement process. In a single-stage approach, the Joint Contracts Tribunal (JCT) 2017 *‘Tendering Practice Note’* observed that bidding contractors *‘will do enough preparatory work to be successful at tender but are unlikely to be able to understand fully all aspects of the project or have sufficient time to identify and consider how to manage the potential risks to the project’*²⁵⁴.

A two-stage procurement process can use provisional appointments which govern a pre-construction phase during which the appointed team members’ tender proposals and safety commitments can be tested, and often improved upon, before the full implementation of the project is approved. The JCT Tendering Practice Note recognised that this *‘increases the scope for value engineering, through early contractor involvement, teamwork and fixed (rather than estimated) sub-contractor pricing, and... reduces the scope for claims that result from inaccurate or inadequate designs or specification. With the design and procurement processes being in part concurrent, it may also save time’*²⁵⁵.

A new standard for setting and overseeing competence frameworks is being developed, currently known as the *‘BSI Flex 8670 Built environment – Overarching framework for competence of individuals – Specification’*.²⁵⁶ The sector-specific frameworks proposed by the CSG continue to be refined against this standard and the industry is

²⁵² Dame Judith Hackitt’s Independent Review, Recommendations, page 13.

²⁵³ Dame Judith Hackitt’s Independent Review, Section 9.12, page 109.

²⁵⁴ <https://www.jctltd.co.uk/product/tendering-practice-note> .

²⁵⁵ <https://www.jctltd.co.uk/product/tendering-practice-note> .

²⁵⁶ *Built environment – Core criteria for building safety in competence frameworks – Code of practice*, 2021, [BSI Flex 8670 v3.pdf](#)

expected to develop training routes that match these frameworks covering the skills, knowledge, experience and behaviours required to undertake an appointed role in a way that ensures compliance with Building Regulations and best procurement practice. While skills, knowledge and experience can be determined, measured and compared objectively, the behavioural aspects of competence are harder to analyse and rely on additional techniques such as workshops.

When considering competence within an organisation, the ISO 44001 standard describes how:

- *‘Organisations will need to determine the necessary competence of people doing work that, under its control, affects the management system’s performance, its ability to fulfil its obligations and ensure they receive the appropriate training’*
- *‘In addition, organizations need to ensure that all people doing work under the organisation’s control are aware of the collaborative relationships policy, how their work may impact this and implications of not conforming with the collaborative business relationship management system’²⁵⁷.*

The 2018 post-Grenfell Housing Forum report *‘Stopping Building Failures’* noted that *‘On housing programmes, the financial elements of the bid will include the construction costs, overheads and profits, costs of staff transferring as a result of TUPE (particularly on repairs and maintenance programmes), and the cost of any social value proposals including apprenticeship opportunities. However, there are other financial elements that can be evaluated including discount cost savings over the lifetime of the contract and life-cycle costs’*.²⁵⁸

The former Office of Government Commerce included among its critical factors for success the *‘award of contract on the basis of best value for money over the whole life of the facility, not just lowest tender price’*²⁵⁹. Evaluation by reference to balanced criteria is more demanding than a straightforward comparison of prices, but the bidders’ method statements and qualitative submissions provide valuable information that create the foundations for reliable commercial relationships.

A persistent concern remains that financial evaluation will inevitably dominate a selection procedure and will tempt bidders to undercut each other’s prices regardless of other criteria. Overcoming this problem requires the client and its advisers to make

²⁵⁷ ISO 44001.

²⁵⁸ *Stopping Building Failures*.

²⁵⁹ OGC (2007), *Achieving Excellence in Construction*, Construction Projects Pocket Book, (Achieving Excellence in Construction Procurement Guides), no. 1-11, London, Office of Government Commerce.

clear their priorities in a way that bidders respond to, for example by evaluating quality first and then evaluating cost, taking the benchmark price from the highest quality bid. The Housing Forum in *'Stopping Building Failures'* suggests other evaluation models *'that seek to protect the contracting authority and the bidders from an unrealistic pricing risk'*:

- *'The optimum pricing model in which the contracting authority sets out the optimum price which it considers appropriate for the contract, based on market research. The tenderer is then incentivised to make the effort to reach the optimum price without undercutting it. The tenderer closest to the optimum price receives the highest mark. This should protect against abnormally low bids but arguably curbs the potential for truly innovative approaches'*
- *'The fixed price model where the contracting authority fixes the price for the contract and then undertakes a value for money evaluation on the non-price element of the contract's delivery, such as the quality and experience of the team, choice of materials, health and safety standards, liaison with residents, or environmental and social aspects of the project. By fixing the price and considering alternative value for money proposals, the contracting authority will again be neutralising the effect of any abnormally low bids on the overall evaluation'*²⁶⁰.

The Trowers & Hamblins December 2020 White Paper *'Price evaluation models for the housing sector'* considers the recommendations of a working group looking at alternative pricing models and how they can be used in the housing sector to secure sustainable outcomes²⁶¹. The Trowers paper provides helpful comparisons between alternative methods of evaluating bidders' tender price submissions in an endeavour to discourage a *'race to the bottom'* and encourage the submission of bids that demonstrate sustainable value across the life of a contract, rather than artificial savings at the point of procurement.

8.3 Can collaborative evaluation consider individual competence?

Dame Judith Hackitt's Independent Review stated that:

- *'Competence across the system is patchy.'*²⁶²
- Recommendations include *'Setting out demanding expectations around improved levels of competence'*²⁶³.

²⁶⁰ *Stopping Building Failures*.

²⁶¹ *Price evaluation models for the housing sector'*, Trowers & Hamblins December 2020 White Paper <https://www.trowers.com/insights/2020/november/white-paper-price-evaluation-models-for-the-housing-sector>

²⁶² *Dame Judith Hackitt's Independent Review*, Executive Summary, page 11.

²⁶³ *Dame Judith Hackitt's Independent Review*, Recommendations, page 13.

In response to the competence concerns raised in Dame Judith Hackitt's Independent Review, the Competence Steering Group ('CSG') was established with multiple working groups to consider how to improve competences in a wide range of industry roles relating to buildings in scope. For procurement, the CSG Key Recommendations were:

- *'There must be a designated individual who is assigned as a Procurement Lead. This lead must have a comprehensive competence level at every stage of the RIBA Plan of Work*
- *The Procurement Lead will be assessed and accredited against a new procurement competence framework which identifies the capabilities and knowledge that are needed to carry out all procurement activities identified for in scope buildings*
- *Implementing this Procurement Lead role will need a culture change in the construction sector and work is needed to raise awareness of the new competence requirements for procurement activities to ensure appreciation and compliance.*²⁶⁴

ISO 44001 suggests that the evaluation criteria for the members of a collaborative team can include assessment of each organisation's commitment to collaborative working, including for example:

- *'Collaborative profile and experience*
- *Cultural compatibility*
- *Customer relationship management*
- *Supplier relationship management*
- *Stakeholder implications.*²⁶⁵

A University of Reading report in 2018 described how evaluation criteria for team members on the 'Dudley College' Trial Project included behaviours such as:

- Ability to work in a spirit of mutual trust
- Ability to work with a 'no-blame mindset'
- Ability to understand/appreciate perspective of others and adapt behaviour appropriately

²⁶⁴ *Setting the Bar*, 2020, Competence Steering Group
<file:///C:/Users/K1217231/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/U41R7X19/Built%20environment%20and%20fire%20industries%20set%20out%20blueprint%20for%20improving%20competence%20and%20driving%20culture%20change.pdf> .

²⁶⁵ *ISO 44001*.

- Mutual respect between differing disciplines and personalities.²⁶⁶

The Reading report explained how *‘following post-tender interviews, a behavioural workshop was held with bidding parties to validate the assessments made by the Client Advisory Team from previous assessment activities. Behavioural analysis or other forms of psychometric profiling of individuals and teams can be revealing but is a demanding process and, in the absence of contractual constraints, it cannot prevent those individuals leaving an organisation after its appointment’*.²⁶⁷

8.4 How can ESI improve building safety?

Dame Judith Hackitt’s Independent Review states that a client and its team should *‘establish procurement processes that allow sufficient time, resources and prioritisation to deliver the core objectives’* and to *‘Identify how core building safety requirements will be met in the pre-construction phase’*.²⁶⁸

The ability of the parties to influence project outcomes, including safety and quality, cost and time certainty, improved value, improved performance and the flexibility to incorporate changes, is much greater in the earlier conceptual and design stages of the project. By the time that manufacturing, delivery and construction operations are underway, the opportunities to agree safety and quality improvements, and to manage safety and quality risks, have reduced significantly.

ESI can assist in mitigating the fragmentation, defensiveness and failures to share important information that are typical of many traditional procurement models. It promotes a more integrated and holistic approach to project initiation, development and implementation and it actively encourages the open and transparent sharing of key project information amongst all team members, including in relation to safety.

Collaborative procurement using ESI maximises the benefits of early, value-based team selection processes by creating conditional contracts that can prioritise safety and take into account the interests of residents. ESI procurement processes and contracts can make clear:

- How and when team members will establish, check, integrate and agree the safety and quality compliance of their designs and specifications with all related cost, time, supply, construction, maintenance and risk management information and activities
- How and when team members will establish, check, integrate and agree the safety and quality compliance of all proposed subcontractors, suppliers and manufacturers

²⁶⁶ https://docs.wixstatic.com/ugd/b66306_c49110df68af446091e293c1d4fe8650.pdf.

²⁶⁷ https://docs.wixstatic.com/ugd/b66306_c49110df68af446091e293c1d4fe8650.pdf, p.64.

²⁶⁸ Dame Judith Hackitt’s Independent Review, Table 2, page 34.

- How and when team members will establish, check, integrate and agree the safety and quality compliance of all working practices on and off site
- How to improve safety through direct lines of communication between the client, design consultants, contractors and key subcontractors and suppliers²⁶⁹.

ESI provides an opportunity for the team to assess and plan to mitigate health and safety, operational, commercial and other related risks. ESI also improves opportunities for contractors, sub-contractors and specialists to provide input to design and specification development, enhancing agreed outputs and identifying better value solutions, including those relating to off-site fabrication and other modern methods of construction and allow them to be part of developing the solution to the right quality levels and increase safety collaboratively²⁷⁰.

An integrated ESI timetable sets out agreed deadlines and interfaces between team members and sits at the heart of collaborative procurement. Without it, there is the risk that ESI commitments will be open-ended and will allow delays in starting and proceeding efficiently with a particular stage of design, supply chain planning and risk management²⁷¹.

Collaborative ESI should set out agreed risk management actions in respect of safety and quality concerns and should recognise where external influences may cause delays that are outside the control of team members. ESI can then assist team members in identifying opportunities to mitigate the effects of these external influences²⁷².

On the St George's Hospital Keyworker Accommodation project, the team used open-book costing to agree a maximum price, following which '*monthly critical analysis ensured that financial risks could be eliminated or quantified....allowing the client to instruct change instructions which increased the quality of the project*

²⁶⁹ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* pp.28,29. <https://www.gov.uk/government/publications/collaborative-procurement-guidance-for-design-and-construction-to-support-building-safety>

²⁷⁰ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* p.29.

²⁷¹ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* p.32.

²⁷² *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* pp.38, 39.

*further, safe in the knowledge that costs would be confined within the agreed maximum price’.*²⁷³

8.5 How does fair payment improve building safety?

Dame Judith Hackitt’s Independent Review stated that *‘it is incumbent on all dutyholders to ensure that the procurement process they use drives the correct behaviours throughout their supply chain’.*²⁷⁴ The Construction Playbook underlines the importance of providing a fair return and reasonable payment terms for the construction industry, based on the fundamental principle *‘that contracts should be profitable’*²⁷⁵ for a market to be sustainable. It notes that unreasonable payment terms and unsustainable cost reductions *‘can create a bias towards low quality and can increase the probability of contract failures’*²⁷⁶. An unreasonable approach to payment at any level of the supply chain undermines trust, collaboration and, ultimately, building safety²⁷⁷.

Dame Judith Hackitt’s Independent Review stated that: *‘Payment terms within contracts (for example, retentions) can drive poor behaviours, by putting financial strain into the supply chain. For example, non-payment of invoices and consequent cash flow issues can cause subcontractors to substitute materials purely on price rather than value for money or suitability for purpose.’*²⁷⁸ Team members need a clear understanding of what work attracts remuneration and what work is undertaken speculatively. The incentive of a pipeline of work may attract some speculative proposals for improved value. However, if a consultant or contractor can only expect to be paid if a project proceeds on site, then commercial logic dictates that its first priority will be to ensure that the project goes ahead rather than to provide objective advice on how to improve value²⁷⁹.

²⁷³ <http://www.ebuildingcontracts.co.uk/wp-content/uploads/2017/09/10-Year-Anniversary-PPC-and-5-Year-TPC.pdf>.

²⁷⁴ Dame Judith Hackitt’s Independent Review, Section 9.8, page 109.

²⁷⁵ Construction Playbook, p. 49.

²⁷⁶ Construction Playbook, p. 49.

²⁷⁷ Guidance on Collaborative Procurement for Design and Construction to Support Building Safety pp.36, 37.

²⁷⁸ Dame Judith Hackitt’s Independent Review, Section 9.11, page 109.

²⁷⁹ Guidance on Collaborative Procurement for Design and Construction to Support Building Safety p. 37.

The Construction Playbook requires that ‘*Contracting authorities and suppliers should always pay their supply chain promptly*’²⁸⁰. Payment security is essential to collaborative procurement, but manipulation of supply chain cashflow has often overridden other considerations. Payment abuse directly affects building safety because financial pressures can lead to shortcuts and compromises in quality. Poor payment practices are also a major barrier to collaborative working. Project bank accounts (‘PBAs’) enable supply chain members to be paid faster because monies do not have to cascade through different levels of contracting and because there is some protection of funds from upstream insolvencies. Since 2010, Government policy has been that PBAs must be used unless there are defined, compelling reasons not to use them, and this is reflected in the Construction Playbook.

8.6 How can collaboration issue resolution improve building safety?

ISO 44001 describes a system for joint issue resolution relevant to building safety risks that:

- *‘Defines a decision-making hierarchy*
- *Identifies and resolves issues at the earliest practicable opportunity*
- *Assigns importance, priority and/or timeframe, and responsibility for resolution at the optimum level*
- *Tracks the status of the issue: e.g. open, investigating, escalated, resolved*
- *Aligns with any agreement and/or contracting approach and integrated with lessons learned*’²⁸¹.

On the Greenwich Council housing repairs and maintenance alliance ‘*the Core Group and Partnering Team structures promoted communication which ensured the right people were dealing with issues at appropriate levels.*’

On the Glasgow Housing Association £1 billion programme of stock refurbishment and new build for over 40,000 properties which required the coordination of 63 housing associations with 24 constructors and 27 framework consultants. Its alliance contracts provided for:

- *Use of a contractual Core Group as ‘an essential means for joint problem solving and strategic decision making’*
- *A supply chain structure which ‘allowed GHA to create supplier framework agreements with key components suppliers, so they had representation on*

²⁸⁰ *Construction Playbook*, p. 53.

²⁸¹ <http://www.ebuildingcontracts.co.uk/wp-content/uploads/2017/09/10-Year-Anniversary-PPC-and-5-Year-TPC.pdf>.

A 'Core Group' is the transparent, collaborative decision-making body that is described in the PPC2000, FAC-1 and TAC-1 contract forms. The need for Core Group decisions to be unanimous has been very successful in enabling team members to seek agreement of collaborative innovations and solutions while protecting their reasonable commercial interests. A similar group is provided for in the NEC4 Alliance Contract 'Alliance Board' but not in the other NEC4 contracts or in the JCT2016 contracts,

Construction projects carry a wide variety of risks and can benefit from collaborative assessment of ways to minimise the potential impact of those risks. The Construction Playbook states that *'The key is to have joined up, transparent mechanisms to identify and handle foreseen and unforeseen risks and opportunities when they arise'*. Many risks can be managed jointly by a collaborative team if they put the right contractual machinery in place, and ISO 44001 states that *'an effective collaboration is one where the parties share responsibility as far as is practical in supporting the individual risk of the partners.'*

The Construction Playbook requires that team members use a joint risk review system for *'exploring opportunities to develop solutions that help to mitigate risk through joint working before construction commences'*. Resident representatives have the first-hand knowledge that can make them valuable participants in joint risk reviews. Joint risk management creates new opportunities for risk mitigating actions, and ISO44001 notes that this starts with *'identification of risks that need to be raised with collaborative partners to ensure the most effective approach is adopted'*. ISO 44001 states that these risks should be set out in a shared risk register, which *'shall be maintained as part of the documented information and shall be part of the joint risk management process'*.

The joint management of risks by the members of an integrated team reduces the wasted costs that arise from arbitrary risk premiums. The early exchange and review of risk information also ensures that team members can provide more reliable warranties for their work, including their contributions to safety and quality²⁸³. In order to agree and implement joint risk management processes, it is important that all team members have

²⁸² <http://www.ebuildingcontracts.co.uk/wp-content/uploads/2017/09/10-Year-Anniversary-PPC-and-5-Year-TPC.pdf>.

²⁸³ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* p.39.

the same appreciation of the identified risks. The Office of Government Commerce included in its 2007 *'Critical Factors for Success'* a system of *'risk and value management that involves the entire project team, actively managed through the project.'*²⁸⁴The Construction Playbook requires:

- A contractual system for the efficient sharing of risk information and agreement of risk management actions, enabling *'early risk work focused on achieving project strategic objectives and alignment'*
- The use of ESI for *'exploring opportunities to develop solutions that help mitigate risk through joint working before construction commences'*
- A contractual structure for the *'sharing of appropriate risk registers and transparent communication on risk allocation with prospective suppliers and the supply chain.'*²⁸⁵

A clear communication system is necessary to ensure that the views of resident representatives are notified, considered, discussed and taken into account. This system needs to be reliable and fully understood. It needs to go beyond informal lines of contact, standard complaints procedures and the points raised at meetings convened for other purposes²⁸⁶. ISO 44001 notes that a collaborative team should *'establish, maintain and actively manage an effective communication process, including the messages for key stakeholders (including all collaborative parties), the vision, the objectives behind the collaboration and how concerns will be managed'*.²⁸⁷

The role of residents as stakeholders in a housing project can be spelled out in the contract terms. For example, PPC2000 requires the team members to *'work together and individually in accordance with the Partnering Documents to establish the maximum involvement in the Project...by those Interested Parties listed in the Project Partnering Agreement.'*²⁸⁸ An inclusive approach to collaborative procurement can also be enhanced by involving residents and other stakeholders in liaison groups and facilitated workshops²⁸⁹.

²⁸⁴ OGC (2007), *Achieving Excellence in Construction*, Construction Projects Pocket Book.

²⁸⁵ *Construction Playbook*, p. 49.

²⁸⁶ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* pp. 40, 53.

²⁸⁷ *ISO44001*.

²⁸⁸ PPC2000 clause 1.3.

²⁸⁹ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* p.40.

In a potential dispute on the Bewick Court tower block, arising from the insolvency of the cladding specialist, solutions were agreed as a result of:

- Involvement of the client and project manager with the main contractor in early selection and appointment of the cladding specialist, creating clear cost information with which to analyse cost consequences of replacing that specialist
- Early establishment of a communications strategy, utilising a Core Group and Early Warning for joint risk management
- A clear role for the client participating in Core Group problem-solving activities.

The cost consultant on the Bewick Court project commented that: *'We could have seen contractual claims against both the client and the contractor and worst of all a project not yet concluded, resulting in another cold winter for Bewick Court residents. Instead, the project finished on time and within its maximum price and the team remains firmly on speaking terms.'*²⁹⁰

8.7 How can leadership and management improve building safety?

Collaborative procurement needs to be supported by professional management and active client leadership. Leadership and management are essential to creating and maintaining a collaborative culture and ensuring the delivery of safe, high quality results²⁹¹. If clients and managers do not show active commitment to shared objectives, this will have an adverse impact on supplier trust and on the efforts that suppliers devote to improved outcomes. Where frameworks and projects have the benefit of collaborative leadership and management, this can inspire suppliers to make additional efforts and to take on leadership roles in the delivery of projects and portfolios of work.

The roles of clients, supported by managers, include:

- To define the strategy, scope and objectives of the projects
- To create clear, outcome-focused briefs, and to ensure a consistent approach to the briefs for projects and programmes of work
- To create and implement a balanced approach to evaluating supplier proposals for appointments, and to the award of projects and programmes of work

²⁹⁰ <http://www.ebuildingcontracts.co.uk/wp-content/uploads/2017/09/10-Year-Anniversary-PPC-and-5-Year-TPC.pdf>.

²⁹¹ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* p.48.

- To respond swiftly to problems and to seek consensus on strategic decisions
- To create and implement transparent performance measures linked to incentives for delivering improved value.

Effective leadership and management start with strategies and flow through procurement and contracting. The Surrey Project Horizon Trial Project supply chain framework alliance reported that it attracted ‘*personal leadership and the recognition of different stakeholder interests in client and contractor organisations who need to be identified, consulted and persuaded to adopt a new and bolder approach*’²⁹². They encountered no major health and safety incidents at all over a five-year period.

A collaborative framework culture can be compromised if clients do not take framework objectives and commitments into account when managing call-off projects, for example when a client uses a contractor framework but appoints a project consultant who is not connected with or interested in the contractor framework. Framework managers need to monitor project level client leadership and management in order to ensure that these remain consistent with agreed framework objectives and do not undermine the collaborative culture created at framework level.

The collaborative roles and responsibilities of managers include the fair and constructive exercise of any discretion, and an active approach in leading and coordinating the implementation of:

- Outcome-based strategies, procurement and incentivisation
- Guidance to clients on effective call-off and project procurement
- Value improvement and risk management processes
- Consistent, proportionate and relevant performance measurement
- Collaborative decision-making and dispute avoidance.

Collaborative management includes decision-making processes that require collaborative skills in order to draw clients and suppliers together, motivate their joint working and help them to integrate their different commercial interests²⁹³. The work of managers should be supported by a contractual decision-making process that gives appropriate collective authority to clients and suppliers through a forum such as the ‘*Core Group*’²⁹⁴. A manager should use this system to act as an ‘*integrator*’, helping clients and suppliers to:

²⁹² Case study 4 (e) and *Project Horizon Trial Project* case study.

²⁹³ *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* pp.37, 38.

²⁹⁴ For example, as per FAC-1 clause 1.6, TAC-1 clause 1.6 and PPC2000 clauses 3.3 to 3.6.

- Integrate their objectives and commitments
- Integrate the agreed proposals and commitments of multiple suppliers
- Integrate participation by clients and suppliers in joint value improvement and risk management activities
- Integrate consistent approaches to the call-off and delivery of projects and programmes of work
- Integrate consistent and transparent performance measurement based on achieving strategic and project outcomes and value improvements²⁹⁵.

9 Delivering the Four I's of collaborative procurement

Based on the successes reported by high-performing teams and the challenges they acknowledged, the research team concluded that transparent and efficient practices designed to reduce waste and improve outcomes need to cover four interlocking stages that comprise strategy, procurement, contracts and management.

These interlocking stages can be summarised as the following 'Four I's' of intention, information, integration and incentivisation illustrated in Figure 6:

- **Strategy** establishing the **intention** of clients in terms of credible plans and commitments, clear requirements for project outcomes and clear expectations for improved value and reduced risks
- **Procurement** exchanging the **information** between clients and prospective suppliers that forms the basis on which to implement agreed plans and commitments, to achieve required project outcomes and to meet expectations for improved value and reduced risks
- **Contracts** creating and sustaining **integration** of the mutual commitments of clients and suppliers, supported by supply chain members and managers, to implement agreed plans and commitments, to achieve required project outcomes and to meet expectations for improved value and reduced risks
- **Management** achieving **incentivisation** through instructions, support, guidance and motivation for clients and suppliers to integrate their mutual commitments, to implement agreed plans and commitments, to achieve required project outcomes and to meet expectations for improved value and reduced risks²⁹⁶.

²⁹⁵ *Constructing the Gold Standard* p.34.

²⁹⁶ *Constructing the Gold Standard* pp.16,17.

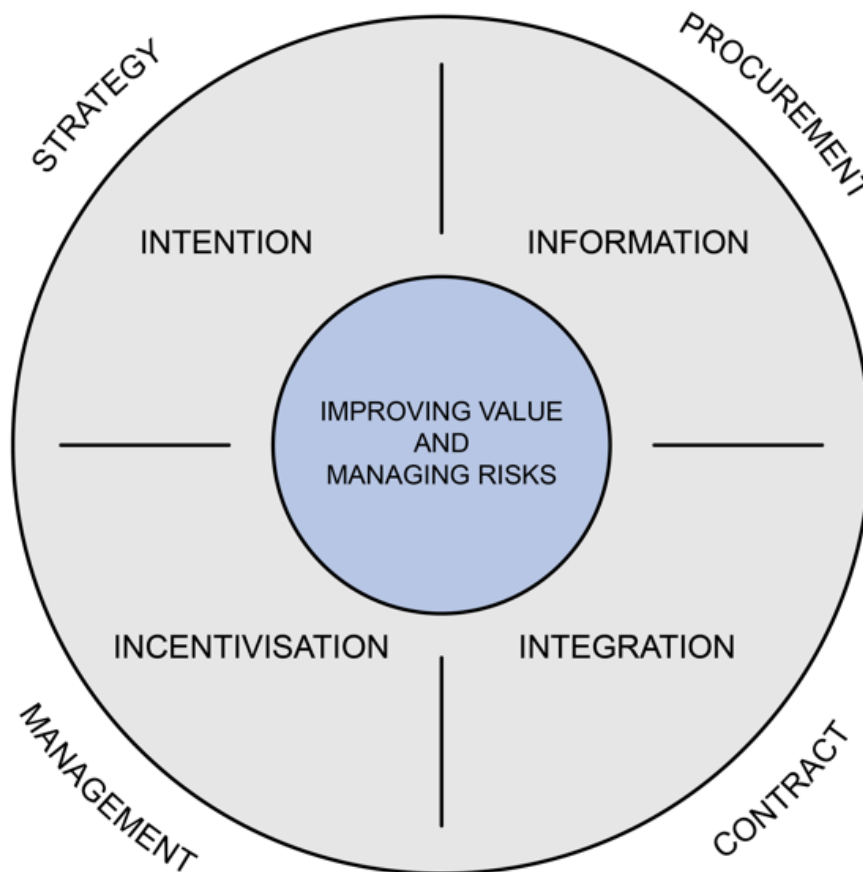


Figure 6: The Four I's of collaborative procurement

Based on the evidence shared in case studies the research team also concluded that collaborative procurement is more effective when undertaken through a long-term relationship established under a framework alliance or term alliance. The good collaborative practices that are developed and proven on a standalone project are not easily transferable for adoption by other clients and suppliers where:

- The personnel from different organisations in each new project team are unfamiliar with each other and there may only be a limited level of trust
- The procurement systems for each project provide little opportunity for achieving incremental improvements in efficiency and effectiveness
- The good ideas and efficient practices can be lost when a project team disbands.

There is therefore a frustrating sense of '*Groundhog Day*' when a team has to build relationships from scratch on each new project. By contrast a framework alliance or term alliance provides the opportunities to break this cycle of lost learning and to

achieve more systematic progress. There is greater scope for a framework alliance or term alliance to achieve improved value because the prospect of multiple projects or repeat orders attracts increased personal commitment and corporate investment, because suppliers can then plan with a clearer understanding of potential additional work, and because team members can be expected to learn from project to project.

An additional perceived challenge to collaborative procurement arises from the fragmentation of different specialist disciplines working in sequence or in parallel, focusing on different elements of design, manufacture, construction and operation rather than the whole asset and its whole life cycle. There is also a tendency to compartmentalise the skills applied to strategy, procurement, contracting and management as if they do not relate to the same project. Frameworks can break down these barriers by creating complete teams with aligned long-term interests.

10 Research conclusions

This White Paper has explored in depth the procurement strategies that can optimize whole-life outcomes through systematic engagement with high-performing collaborative clients and teams. It has considered how the processes and relationships associated with collaborative construction procurement can be more closely integrated into the mainstream, and it has examined the roles that BIM and other digital technologies can play in facilitating and supporting this integration.

The research and case studies supporting this White Paper have fulfilled its stated objectives of:

- Learning from the interactions between collaborative behaviours, collaborative procurement models, collaborative contracts and the use of digital technology
- Identifying the impact of collaborative construction and procurement techniques in achieving improved whole life project outcomes
- Identifying the new and improved collaborative approaches that clients and teams can adopt in their systems for strategies, procurement, contracting and management.

The research findings have shown that collaborative construction procurement is not an unusual or experimental approach and should not be considered as available only to highly sophisticated teams. It can be concluded from the research that collaborative procurement should be made more accessible to any client and its supply chain members in order that collaborative processes can become new commercial norms and can be embedded in all aspects of construction strategy, procurement, contracting and framework management.

The research leading to this White Paper has consistently underlined the importance of an integrated approach to the **Four I's** of:

Intention – how do clients establish an appropriate strategy for obtaining improved value through collaborative construction?

Information- what information needs to be exchanged in order to help clients and supply chain members (including contractors, consultants, subcontractors, suppliers and operators) understand each other's positions, reconcile their differing interests and improve outcomes?

Integration – how are relationships between clients and different supply chain members integrated so as to ensure that agreed exchanges take place at the times when they will be of most value?

Incentivisation – why should clients and supply chain members honour their commitments to agreed exchanges of information and related joint activities?

This White Paper has shown how clear collaborative systems can underpin the interrelated stages of the **Four I's** and can provide a strong platform for the intellectual, practical and commercial relationships between collaborative teams. The research case studies have illustrated how the creation and implementation of these systems can optimise the impact of collaborative procurement on benefits for all team members, including improvements in cost certainty and cost savings, in other economic value and in social value,

The research has assessed the cause-and-effect relationships between collaborative procurement models, collaborative contracts and the collaborative use of digital technologies, together with their impact on improved economic, social and environmental value, reduced risks and other improved outcomes. Relevant metrics have included cost, time, health and safety, quality, social value, net zero carbon and risk management. The research has included a particular focus on how collaborative procurement, contractual strategies and digital information management can help to achieve positive whole life carbon outcomes and deliver net zero targets, and how they can affect the safety of design and construction. Research findings have highlighted how procurement strategies for long-term appointments, combined with effective procurement processes and contracts, can help tackle climate change and improve sustainability and how they can also contribute to improved building safety.

It is concluded that, in order to optimise collaborative activities in ways that improve value and manage risks, a team requires clearer mutual commitments that include active coordination and agreed timelines. These commitments create the means to overcome current perceived barriers to collaboration by creating mutual confidence among team members so that each is willing to create and share the data that they all need to deliver

improved whole life outcomes from projects and programmes of work. It is also concluded that clearer approaches to collaborative strategy, procurement, contractual engagement and management are essential to optimise the use of BIM and other digital machinery.

This White Paper has explored the integration of digital tools such as BIM by different collaborative teams, ranging from those projects that adopted successful strategic approaches to the use of BIM to those who made limited use of BIM. The research has identified the potential for significant impact in a new response to this heterogenic approach which was based on:

- The ISO19650:2018 standard which emphasises how ‘*collaboration between the participants involved in the construction projects and in asset management is pivotal to the efficient delivery and operation of assets*’²⁹⁷
- Previous King’s research which explored interest in a multi-party BIM protocol²⁹⁸
- The links between collaborative procurement and BIM which emerge as a central consideration in current initiatives such as the *Construction Playbook* and the ‘*Golden Thread*’²⁹⁹ of digital data underpinning procurement guidance in response to the ‘*Building a Safer Future*’ consultation.

The White Paper has explored gaps in current collaborative machinery and has identified potential benefits in a new contractual model for meeting the collaboration requirements of ISO19650. The research team have developed a multi-party ‘*Integrated Information Management Contract*’ and have shown how this new contractual instrument could help users to overcome obstacles that impede the wider adoption of collaborative procurement and to overcome obstacles that impede the wider adoption of BIM. The research has concluded that a standard model for an Integrated Information Management Contract could be based on a suitably populated version of the published FAC-1 Framework Alliance Contract³⁰⁰, which is widely recognised as a flexible and proven contractual medium for collaborative working.

The research has found that early adopters of the Integrated Information Management Contract have used this new contractual instrument to fill significant gaps in projects and programmes using BIM by enabling team members to agree and implement direct

²⁹⁷ ISO 19650-1, p.vi.

²⁹⁸ *Enabling BIM Through Procurement and Contracts*.

²⁹⁹ *Building a Safer Future*.

³⁰⁰ <https://allianceforms.co.uk/about-fac-1/>

mutual commitments either on a single project (by integrating any combination of two-party project contracts) or on multiple projects (by integrating any combination of two-party and multi-party project contracts).

The research supporting this White Paper has shown how new contracting and digital tools for collaborative integration are needed in order to tackle the challenges that confront the construction sector. These conclusions are supported by the case studies examined by the research team. This White Paper shows the mechanisms and tools that contribute to the creation of a collaborative and integrated project environment, and in particular how the creation of a fully functioning system of collaborative procurement requires the Four I's to be addressed holistically through an integrated approach to the four interlocking stages that comprise strategy (Intent), procurement Information), contracts (Integration) and management (Incentivisation).

