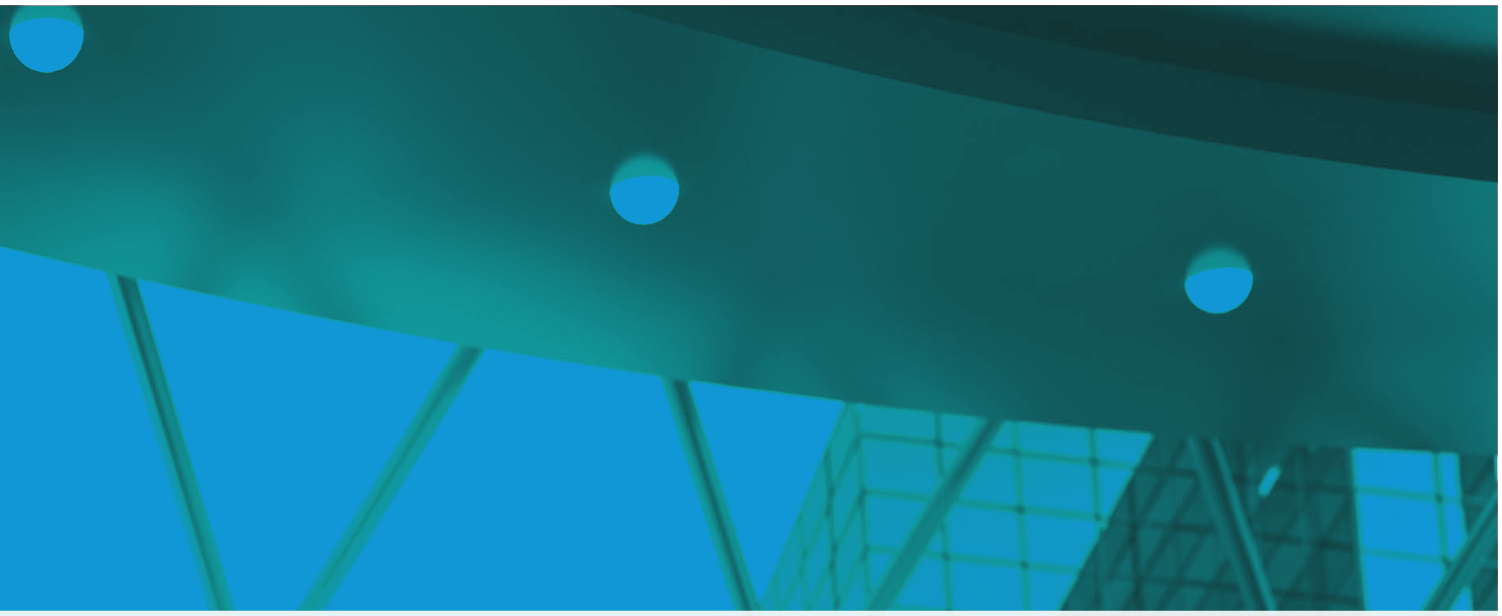
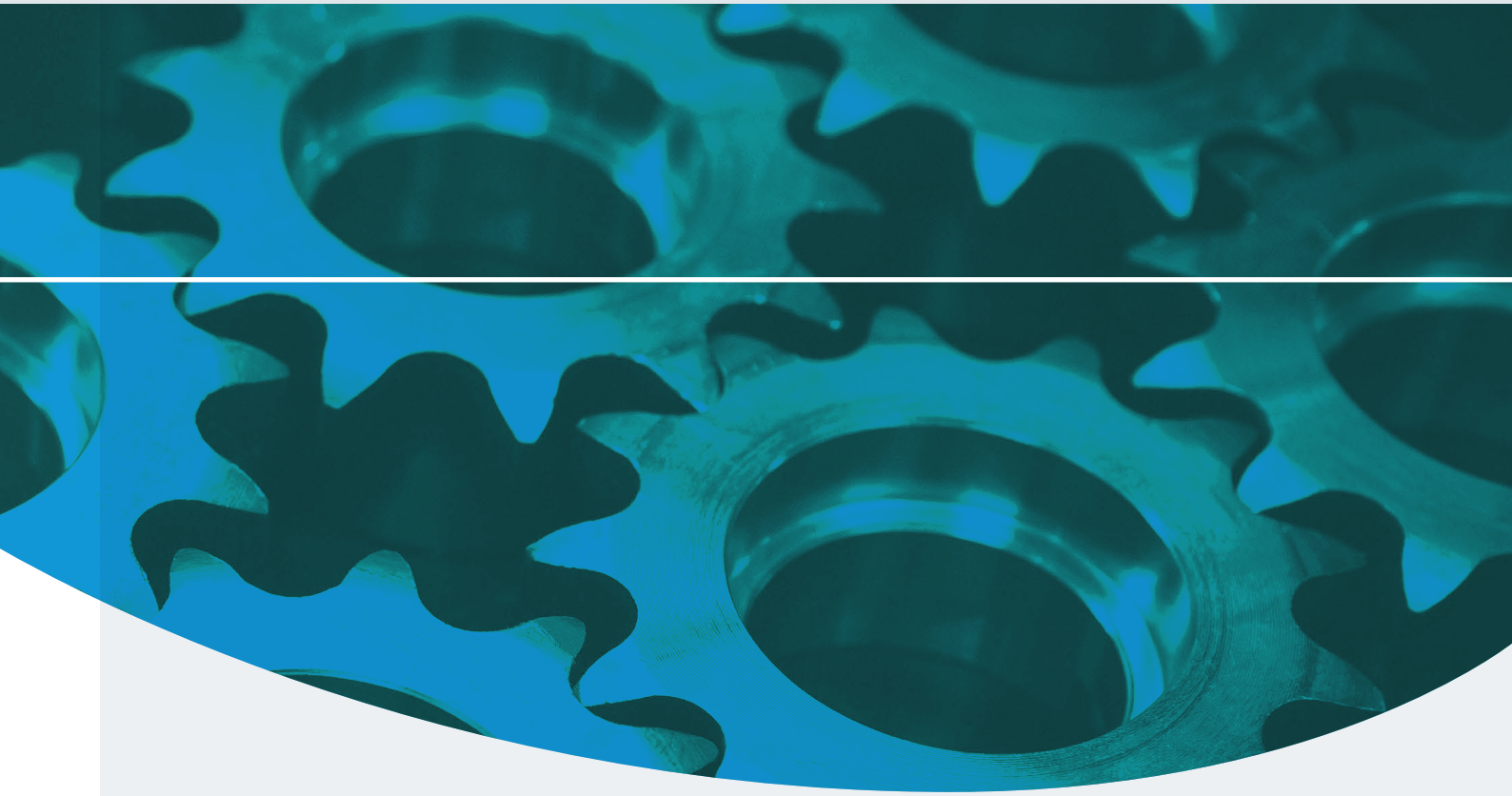


Pinsent Masons

Collaborative Construction 2: "Now or Never?"

A further development of the key themes at the heart of the Construction Industry's reluctance to embrace more collaborative working practices

September 2017



Acknowledgements

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The Report is based upon discussions in workshops and comments on drafts by those working group members listed on the opposite page. The contents however are based on the collective views expressed and should not be seen as necessarily expressing the views of individual working group members or Pinsent Masons.

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> The Industry needs collaboration more than ever and as the Report suggests, I hope that it will be recognised that the time for action is "Now".

Foreword

I am delighted to see this second Collaborative Construction Report from Pinsent Masons, a year after their first report Collaborative Construction – More Myth than Reality?

This is a vital issue for the Industry to address if it is to embrace technology and evolve into the efficient, cost effective and profitable industry which the UK needs for the future.

The first report highlighted the challenges to collaborative working and made a number of clear and compelling reasons for fundamental change and why the status quo will simply not remain an option in the longer term.

I was pleased to be able to chair the launch conference for the first report last September at which an electronic survey of those attending identified a number of key themes for further consideration.

Over the last year the Pinsent Masons team, supported by over 35 key industry figures and experts in Collaboration, have developed their thinking on these key themes into a fascinating and helpful analysis of the barriers to greater collaboration and team working.

They have also developed a comprehensive series of solutions and recommendations for the future which I hope will not just provoke more discussion but will also lead to positive steps forward.

The Industry needs collaboration more than ever and as the Report suggests, I hope that it will be recognised that the time for action is "Now".

I am sorry that I shall be travelling abroad and therefore unable to chair the launch conference but I am grateful to Pinsent Masons and all concerned in the preparation of the Report for helping to ensure that this issue remains at the very top of the Industry and Government agenda.

Sir John Armitt
September 2017

Contents

Pinsent Masons

1.0 Background

This Report follows on from an initial report entitled "Collaborative Construction: More Myth than Reality?" published in June 2016.

In that report we identified the apparent reluctance of the Industry to embrace collaborative working practices more fully, we explored the barriers to change and made suggestions as to what needed to happen if the Industry was to take advantage of the benefits of collaboration before it's too late.

Encouraged by the positive response from the Industry and related media, we committed to preparing this Report in order to examine in greater detail, the key themes emerging from the initial report as voted for by the diverse audience members present at the report launch. The five key themes (in order of the highest number of votes cast) were:

- Effective Team Working
- Industry Leadership
- Contractual Structures and Changing Risk Profiles
- Supply Chain Involvement
- BIM and its Impact on Procurement

One of the principal findings emerging from this Report is that the Industry consistently "contracts for failure, rather than success".

In many ways the Industry is its own worst enemy. On the one hand, it appears to be convinced of the need for change if it is to survive and prosper in the future. On the other hand, there is an inertia and deep-seated reluctance to change established methods of procurement, working practices and to embrace new technologies.

This Report clearly suggests that time is running out. The Industry needs positive leadership and action. In these uncertain times, it could truly be a case of 'Now or Never'.

We were once again assisted in the drafting of this Report by Russell Poynter-Brown from On-Pole Limited, an independent management consultancy specialising in project and team performance improvement in the built environment.

Spotlight

"If you always do what you've always done, you'll always get what you've always got."

Henry Ford

> Teamwork is an essential component of collaboration.

2.0 Executive Summary

A year ago, in our first report Collaborative Construction – More Myth than Reality?, we highlighted the part which collaboration, in all its forms, has to play in moving the construction industry forward. It also summarised the benefits which greater collaboration could bring to embracing new technologies, delivering customer requirements, improving margins throughout the supply chain and ensuring the long term health of the Industry.

We also summarised the main drivers for change and identified the barriers which we considered were preventing greater collaboration even though the long term benefits are generally acknowledged.

With the assistance of over 35 industry experts working in groups moderated by members of the Pinsent Masons team, we have further examined five key themes identified in the responses to our first report.

This second Report represents a more detailed analysis of those key themes and the issues which we consider are at the very heart of the Industry's apparent reluctance to embrace collaborative working principles and techniques on a day to day basis:

Effective Team Working

Deep-seated Distrust

Whilst effective teams can exist outside a collaborative working arrangement, team working is an essential component of collaboration.

Within the Industry, there remains a deep-seated distrust between those charged with procuring projects on the one hand and the supply side of the industry on the other, together with a desire to shift risk rather than to manage or share risk. This can often result in a duel between the client's representatives and the members of the delivery team, focused on securing ultimate protection for the client and preparing the ground for the ability to blame in the future instead of focusing on project delivery.

Team Dynamics and Behaviours

Collaboration and effective team working is not wholly dependent on "best behaviours". More important is the ability to hold difficult conversations and "confront issues without being confrontational". Teams that are able to embrace conflict openly without judgment and without personalising the debate tend to solve issues and problems more easily. It is when conflict and challenges arise that teams' performance is tested.

Independent Coaching

Many teams can benefit from the use of an independent person to manage and to coach them through the challenging issues which they will inevitably face. Although a number of standard contractual structures already provide for the use of an independent adviser or manager, few clients appoint anyone to these roles or alternatively see the role as focusing on purely technical or operational issues. There should be greater willingness to use independent specialists.

Effective Leadership

The importance of leadership cannot be underestimated. The most effective construction teams benefit from an effective leader who can coordinate their collective efforts and provide a strong sense of direction. However, such leaders need to be sympathetic to the need for financial performance but not allow that to detract from achieving the overall project objectives.

The success of teams is also predicated upon team members who are prepared to follow effectively but who are also prepared to demonstrate leadership at key points during a project.

> Government is a crucial enabler for change.

Industry Leadership

A Fragmented Industry

The construction industry is, by its nature, highly fragmented and has traditionally struggled to find any leadership voice which is truly representative of the whole industry.

We agree with the Farmer Report[1] that a tripartite integrated leadership between clients, Government and the Industry is essential to the future wellbeing of the Industry.

In the shorter term, changes are likely to be forced upon the Industry by disruptors and enlightened clients. In the longer term however, the establishment of an Industry-wide body with close links to Government and with the ability to speak with one voice must be a priority.

The Construction Leadership Council

In order to be truly effective, the CLC needs to demonstrate greater democracy in the appointment/election of its members and its membership needs to be more diverse and pan industry. Taking the appointment/election process away from Government and establishing a separate nominations/election process would be a positive step.

The CLC needs greater administrative support, access to top quality research facilities and funding if it is to become more effective. It also needs more time, funding and resource to develop a positive agenda for the Industry.

Government

Government is a crucial enabler for change and also a major client of the Industry. Government needs to improve the way in which it procures and commissions design and construction operations via its various agents with a view to achieving greater consistency of approach and to practice what it preaches.

A sustained and coordinated follow-up of the work carried out or initiated by Government through BIS and BEIS under previous Chief Construction Advisors would be desirable, so that the Industry can benefit from the work of the BIM Task Force and UK BIM Alliance, as well as the recommendations in the Digital Built Britain Report.

Further Education and Centres of Excellence Educators and training professionals need to provide more holistic training to students. This will enable them to see their specific discipline or training in the context of the work of other Industry professionals and the whole financing, procurement design and construction process, rather than just in their own narrow sphere of operation.

Greater investment should be made in Centres of Excellence which can collate information and evidence, which can then demonstrate the value of new techniques, construction methods and technology. This should provide the Industry with greater awareness and confidence in the benefits.

Professional Bodies

Professional bodies need to look closely at the changing roles of their members and equip them for those roles through revised and enhanced training and development programmes.

Project Finance

The project finance industry should endeavour to understand more about the benefits of collaborative/risk sharing approaches to procurement and develop new approaches to measuring financial success of projects, including valuing the true cost of an asset over its whole lifecycle.

The Major Clients

Leaders of substantial industry clients with large portfolios of work, including major developers and public sector bodies, are likely to become a catalyst for change as they increasingly require new approaches from the Industry.

Ultimately, however, it will be the availability of clear and compelling evidence of the impact of smart technology and collaborative techniques on the quality of design and construction and the ultimate user experience, operational efficiency and cost which will drive and sustain real change.

1 The Farmer Review of the UK Construction Labour Model – "Modernise or Die: Time to decide the industry's future", Mark Farmer, October 2016

Contractual Structures and Changing Risk Profiles

Contracting for Success

The Industry needs a paradigm shift; to collaborate is to "contract for success "as opposed to "contracting for failure". Far too many contracts are set up to cater for failure. Contracts allocate risk inappropriately and tend not to incentivise, leading to an adversarial approach to problem solving or avoiding blame.

Budgets should be prepared on the basis of up-to-date cost information if the project team is required to collaborate to create value for the client.

There needs to be sufficient profit in a project to enable incentives to be offered and for benefits to be widely shared.

True collaboration requires an environment where there is an equitable sharing of risks and fair incentivisation.

Project Planning and Team Selection

Greater consideration needs to be given to the team which is assembled at the project planning stage. Clients should document and quantify their precise requirements before commencing the tender process, whilst also focusing on the out turn solution. Once the tender process commences the opportunity to structure the project to best overall advantage is lost.

Tender selection processes need to establish which team is best placed to undertake the project and not just that which has submitted the lowest price. Selection criteria should emphasise what constitutes long term wider value for the client. Contractors should be engaged soon after the outline design stages, if true benefit is to be gained from collaboration and an integrated solution developed for the client.

Behaviours

All parties are likely to benefit from the appointment of an independent behavioural / cultural advisor who can advise on the behaviours which will be required for a project to succeed, the outputs necessary and can monitor compliance against objectives throughout the project.

Professional Advisers

Project Managers and Cost Managers need to be truly "even handed " for collaboration to be encouraged and to work on behalf of the project as a whole, not just in the client's sole interest. If not, then this can lead to an unhelpful emphasis on costs and shifting of risk as opposed to other aspects of the project.

Alignment and Incentivisation

Contracts need to be aligned across the supply chain and the project aims reflected in all supply chain agreements.

In addition, the contractor and key supply chain members need to be incentivised to collaborate and be rewarded commensurate with the value which they bring. Incentivisation in bilateral contracts tends to focus on the interests of the client and the main contractor; it does not necessarily benefit the wider project team or get passed down the contractual chain.

> BIM generated data will become increasingly important to the operation and future efficiency of built assets

Supply Chain Involvement

The Changing Role of the Supply Chain

The role of the supply chain has changed with fewer direct employed staff and greater main contractor reliance on a specialist supply chain, often providing advanced technical solutions. The role of the main contractor has morphed into one which is often more that of a "project integrator", managing numerous interfaces. This has changed the underlying commercial dynamics and increased inter-dependence in the supply chain.

Profits, Payments and Incentives

Greater certainty of profit margin and confidence in payment are essential as a basis for trust and collaboration. The more confidence there is in the commercial basis of a deal, the more the parties will be encouraged to engage in collaborative behaviours.

Collaborative models need to be encouraged with suppliers benefiting from shared incentives and long term relationships and integrating sustainability within procurement rather than simply focusing on bottom line cost.

The Demand Chain

The demand chain now frequently comprises other stakeholders with an interest in the project, not just the ultimate client. As a result, collaboration becomes an even more complex model.

This means that collaboration at project team level may not be suitable for all members of the supply chain. A layered approach to incentivisation and supplier engagement depending on degrees of engagement and the relative strategic importance of each member may be more appropriate.

For the Industry to work on a truly collaborative basis, all stakeholders must exhibit the values and behaviours advocated in this Report, whether those are articulated by way of contractual obligations or otherwise as part of the project/programme delivery and management process. Once again, client organisations have a pivotal role to play in this regard.

Risk Management

Project risk registers should be transparent and developed in conjunction with the supply chain. They should be shared with the supply chain, in particular with those supply chain members best placed to manage the risks.

Procurement processes need to be "upskilled", with those responsible understanding how to assess risk, how to assess the benefits of reducing risk and how to assess value. Shifting the emphasis from lowest price to obtaining better value is also key.

Early Engagement

Early collaboration with key members of the supply chain is vital and will help to reduce uncertainty and provide a stronger starting point for future collaboration.

Greater clarity in defining the scope of a project and what is required of the supply chain at the outset of a project through early engagement is key to encouraging greater collaboration. Recently published contracts such as the NEC 4 suite (and particularly, the NEC's consultative Alliance Contract) and the ACA's Framework Alliance and Term Alliance contracts seek to recognise this.

BIM and its Impact on Procurement

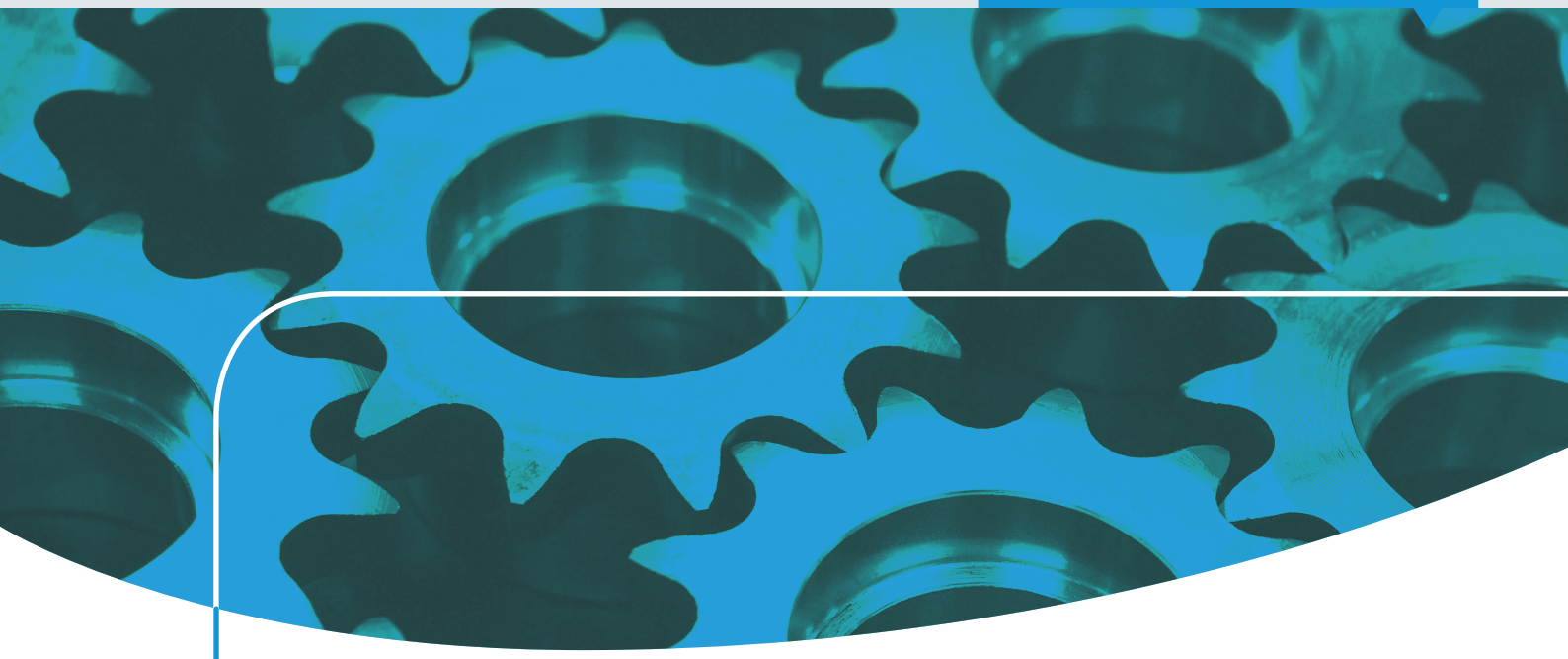
The Use of BIM

Although Building Information Modelling (BIM) has the potential to drive greater collaboration, there is currently a mixed picture of BIM use and understanding in the Industry. In particular, there is doubt as to whether the Government is enforcing the BIM mandate on public sector contracts. In the private sector, use of BIM is patchy at best with significant reluctance by clients to require BIM either through lack of understanding or a belief that BIM adds more cost than value.

Whilst some sectors such as health, education and social housing have adopted BIM widely, others such as civil engineering, infrastructure, private housebuilding and facilities management appear to have been slow to adopt. BIM is currently seen as more suitable for clients who will both own and operate a built asset.

More practical training and education for the industry in relation to BIM will help to clear up misconceptions and encourage a greater understanding of the benefits and risks.

Additionally, there is evidence of a two-speed approach to BIM with larger, more sophisticated players gaining from the benefit of investment in BIM technologies, whilst smaller organisations are lagging behind due to lack of resources or lack of exposure to BIM enabled projects. Government



support for smaller organisations wanting to become BIM enabled through grant funding, tax incentives etc. would reduce the risk of a two-speed Industry.

Early contractor involvement is key to the successful adoption of BIM. Procurement routes which truly connect the design team to the key supply chain members will promote greater collaboration and efficiency. As the Farmer Report[2] remarks: "Industry wide adoption of digitisation through media such as BIM… is predicated on Collaboration. The BIM model sits at the heart of any project and only functions if traditional design and construction barriers are broken down by multi-party liaison and working".

Professional advisors need to improve the way in which they inform clients and manage their expectations about BIM, what it can do, how it translates to traditional methods of procurement and the information and records it will produce. Clients need to appreciate the different outputs which are possible so that the Employer's Information Requirements (EIRs) can be aligned with the client's wants and needs.

The Impact of BIM

There is a view that use of BIM does not necessarily mean that a project will proceed on a more collaborative basis. BIM is a valuable tool, the use of which benefits from collaboration but behaviour does not automatically change because of BIM.

Reports indicate that whilst the benefits of BIM are becoming increasingly clear, they are not well disseminated through the Industry. The greater dissemination of experiences of working with BIM and the benefits it brings, especially potential costs savings is key to the wider adoption of BIM.

There is a lack of appreciation that BIM provides useful data as well as drawings. Although data needs interpretation, validation, and storage, BIM generated data will become increasingly important to the operation and future efficiency of built assets.

BIM Standards

The current BIM standards e.g. BS 1192:2007 and PAS 1192 -2:2013 are considered too large and complex. The Industry would benefit from a clear and simplified set of BIM standards and documents, together with standardised template EIRs and a BIM Execution Plan.

Current BIM standards do not demonstrate sufficiently clearly how BIM fits in with the existing construction documents and drawings and there is no common adoption of those standards.

Information and Communications Technology Incompatibility and interoperability of software remains a serious concern with the risk of errors or loss of integrity when data is exchanged between different systems; there is a need for uniformity of software and a single platform.

Concerns also exist as to the alignment of interests and obligations relating to BIM when using a novated design and build procurement route and the associated responsibility for the BIM model.

BIM Protocols

Whilst the CIC BIM Protocol[3] has assisted the Industry to achieve consistency of BIM obligations and responsibilities across key members of the project team, the Protocol has not been universally adopted.

2 The Farmer Review of the UK Construction Labour Model - "Modernise or Die: Time to decide the industry's future", Mark Farmer, October 2016
3 Building Information Model (BIM) Protocol, CIC/BIM Pro, first edition 2013

People often say they need to be collaborative but what they mean is they need to work better as a team.

3.0 Working Group Reports

Effective Team Working

Spotlight

- Inertia and distrust is endemic within the Industry
- Team coaching should become an accepted part of collaborative working
- The Industry should embrace vulnerability and avoid first recourse to blame, without compromising responsibilities and accountabilities
- Confront issues without being confrontational
- Creating an effective team takes time but is generally well worth the effort

Overview

In examining effective team working, we sought to make an important distinction between collaboration per se and effective team working.

There is a difference between collaboration and team work and that is important, but the terms are used interchangeably. People often say they need to be collaborative but what they mean is they need to work better as a team.

There is a dearth of practical guidance on collaboration and effective team working in the Industry, including papers such as Construction 2025 and other similar Government Industry papers.

However, Mace[4] reports that Google's 'Project Aristotle' identified five fairly radical but insightful factors as being significant for team effectiveness:

- Psychological safety: Can team members take risks without feeling insecure or embarrassed?
- Dependability: Can team members count on each other to do high quality work on time?
- Structure and clarity: Are goals, roles and execution plans clear?
- Meaning of work: Are team members working on something they feel personally invested in?
- Impact of work: Do team members fundamentally believe their work matters?

Effective teams can exist outside of collaborative working arrangements; very effective teams can exist in an adversarial environment where one team is united against another for example (the so-called "them against us" scenario).

Often in such teams, whether consciously or sub-consciously, somebody manages the anxieties and needs of individuals in the team and "their baggage" is dealt with. A nursing study in the 1950's found that more time was spent on the team than actual patient care, an example of task-orientated work with a leader and polarised dissipation of anxieties of the team.

Extensive research sources show that effective teams all had the same sort of inputs:

- Aligned vision
- Time to build team
- Clear roles and responsibilities
- Good communications

So, why is team working not more prevalent in the construction industry?

Construction is a particularly 'anxious' industry. The majority of team participants come from a design, engineering and crafts background and characteristically are focused on delivering an end product, often in challenging circumstances, such as lack of capital and low margins as well as time pressure. Such teams need to maintain a space for creativity to flourish but this often doesn't happen, exacerbating an inherent fear of failure.

Is a team that excludes people a good team or is the inclusive team the best team? The Construction Industry is all about what you know. You should know the answer to questions. This means people are automatically on the defensive and there is a concentration of people with the same qualities in the Industry.

4 Mace (Insights 2017), Winning in the Future; Defining the success of high-performing construction teams

We continue to witness the Industry ethos that it is trained on its technical expertise not its soft skills, often against the background of a rather conservative, risk averse approach. The average age in construction is far older than many other industries. Accordingly, there is a strong argument to say that the 'replenishment' of an ageing workforce provides a longer-term opportunity to change the Industry paradigm, as indeed does the volatility and uncertainty regarding Brexit and the ability or otherwise, to utilise substantial numbers of highly skilled European nationals as key members of the workforce.

On this basis, if construction is to be perceived as a viable and interesting career, then we believe that those who study it need to be taught the principles and application of collaboration and team working as an integral part of their courses.

There are many distinctive challenges in the construction industry that simply are not present in other industries, for example:

- Many construction projects are in essence unique or one-off projects
- There are a plethora of often competing, goals and objectives, be they at individual, project, programme, company or group levels
- Different teams of consultants, joint venture partnering and supply chain members are formed for each project.

However, for things to change, the Industry faces numerous challenges, not least of which is a rapidly depleting labour force. There are three key requirements for change:

- An unambiguous vision of how things could be better
- An understanding of the first few steps (quick wins)
- Dissatisfaction with how things are now

Critically, teams need to understand who and what they are working for and towards and have some sense as to how such goals and objectives are aligned.

Our extensive discussions suggest that it is human nature and inherent potential that defines effective team working; it is about the performance of individuals in particular conditions, namely the interactions and behaviours with one another. Such interactions are not necessarily unique to any particular sector, hence the benefit of seeking exemplars of best practice outside of the construction industry.

Different sectors have different features in terms of team work, for instance, the water and rail industries, where behaviours are regulated by knowing that you will get the next job if you work collaboratively. In the context of one off projects, the parties don't necessarily have the same mind-set.

The Industry 'prepares for the worst and hopes for the best'. It has a reputation for 'crisis-management' and has many 'troubleshooters' who are praised and promoted for fixing problems. So given those incentives, why would they want to prevent the problems in the first place? The Industry tends to be consequence driven, namely identify the problem, fix it and get praise for doing so. Consequently and as further explained in the Contractual Structures and Changing Risk profiles section below, the Industry has a tendency to "contract for failure, rather than success".

Behaviour is driven in two ways. Firstly by antecedents. Studies show that these are only 20% effective at driving behaviour. Secondly, it is driven by consequences and these are 80% effective at driving behaviour.

So, why isn't there more consequence driven behaviour in construction?

The impact of something being incorrect is often suffered by another party rather than the proponent. Where something is wrong, often the company is asked to get someone else to fix it and so the person who made the mistake goes on and keeps doing the same thing over and over. All the more so when moving from one project to another and especially when key information is not shared internally

If people aren't praised for doing the right thing, people stop doing the right thing. With a negative response, they probably won't make the mistake again but it belittles and demeans them. Accordingly, on-going coaching and positive reinforcement is necessary to promote effective good team working.

> Clients and project sponsors must demonstrate a more comprehensive appreciation of the dynamics of teams, in particular those relating to blame and accountability.

Trust is an important element of effective team working but its importance can be overstated. There are a number of key building blocks to trust:

- Integrity
- Transparent intent
- Clear and obvious capabilities
- Track record of delivering on promises
- The importance of ensuring that the 'money is right' (there is frequently a direct correlation between collaboration and potential profit)

It must be acknowledged, however, that not all within the Industry will be willing to or be capable of, embracing effective team working; for many, doing things differently takes more effort than people are willing to commit to.

For example, there is an historic and deep-seated distrust between those charged with procuring and the supply side of the Industry. Too many construction projects start from a risk averse perspective with lawyers, procurement specialists etc. involved from the outset to shift risk, rather than focusing risk on those parties best able to manage those risks and/or bear the consequences, in effect preparing the ground for the ability to blame in the future. In essence, this approach is what we mean by contracting for failure.

For some, it almost becomes a duel between the client's representatives and the delivery team, focussed on ultimate protection for the client without reference to the delivery of the project.

We detect some evidence that major procurers are beginning to embrace and promote the need for more effective team working. For example, High Speed 2 is setting up a £10m framework for collaboration support, a serious statement of intent, whilst Highways England has taken 18 months to 2 years to build a robust framework of behavioural KPIs.

The need for more informed clients/sponsors

Patrick Lencioni[5] identified that teams' fail for two reasons:

- Lack of trust, and
- Peoples' need to feel invulnerable

In order for teams to be truly effective, clients and project sponsors must demonstrate a more comprehensive appreciation of the dynamics of teams, in particular those relating to blame and accountability.

Construction can typically be characterised as a 'blame and claim' business. Blame is a negative emotion; it provides those who readily blame with a semblance of control when in reality, as Brené Brown states, "blame is simply the discharging of discomfort, pain and anger; it has an inverse relationship to accountability".[6]

Accountability, by definition, is a vulnerable process. In teams where blame is commonplace, the members rarely have the tenacity or determination to hold themselves to account. Rather than actively listening in an endeavour to solve problems in a collaborative manner, they focus on making rapid connections in order to find out who is at fault. Accordingly, team members need to be able to express their anxieties or concerns without fear of being judged. There is also an important role for recognising the value of learning from mistakes, which can better be done in a no-blame environment.

There are distinct differences outside of construction as to 'blame' and accountability. For example, the Red Arrows Royal Air Force aerobatic display team undergoes numerous changes of personnel in a typical three year period, which in many industries, would result in chaos and compromise the performance of the team; yet, it is still able to perform at an elite team level. How do they achieve this?

Former Red Arrows pilot and now high-performance consultant Justin Hughes[7], summarises the core competencies of teams as follows:

5 Lencioni, Patrick (2002), The FIVE Dysfunctions of a Team: A Leadership Fable, Jossey-Bass
6 Brené Brown on Blame : RSA Shorts (Espresso for the mind)
7 Hughes, J (2016), The Business of Excellence: Building high performance teams and organisations, Bloomsbury

- Direction (the ability to set and articulate a clear direction and intent)
- Leadership (recognising that leadership can be demonstrated at all levels within a team)
- Execution (the ability to deliver results as a function of people, clarity in task and roles, planning and management of time and resources)

A typical Red Arrows debrief after a training sortie or display is conducted in a collective, disciplined but importantly, non-judgemental way, encouraging the team members to hold themselves accountable for their performance. The primary focus is on examining only the facts (taking any emotion out of the discussion), enabling the team as a whole to learn from an objective, open and wholly honest examination of performance, without blame or highlighting individual team members' vulnerabilities.

In an Industry context, without the ability to confront performance issues on an open and honest basis, without judgement, the fundamental prerequisite of effective team working, namely trust, will inevitably breakdown. That is not to say however, that responsibilities and accountabilities should be 'fudged' or abdicated in any way. Rather, they should be highlighted in a transparent and demonstrable manner.

Clients and project sponsors have a critical role to play in encouraging the right and most productive behaviours amongst their team members.

The need for stronger soft skills in the PM/CM professions

Whilst there is a tacit recognition amongst many teams in the Industry of the theoretical importance of so-called 'soft skills', their application in practice within a team environment is sporadic at best. Such skills include but are not limited to:

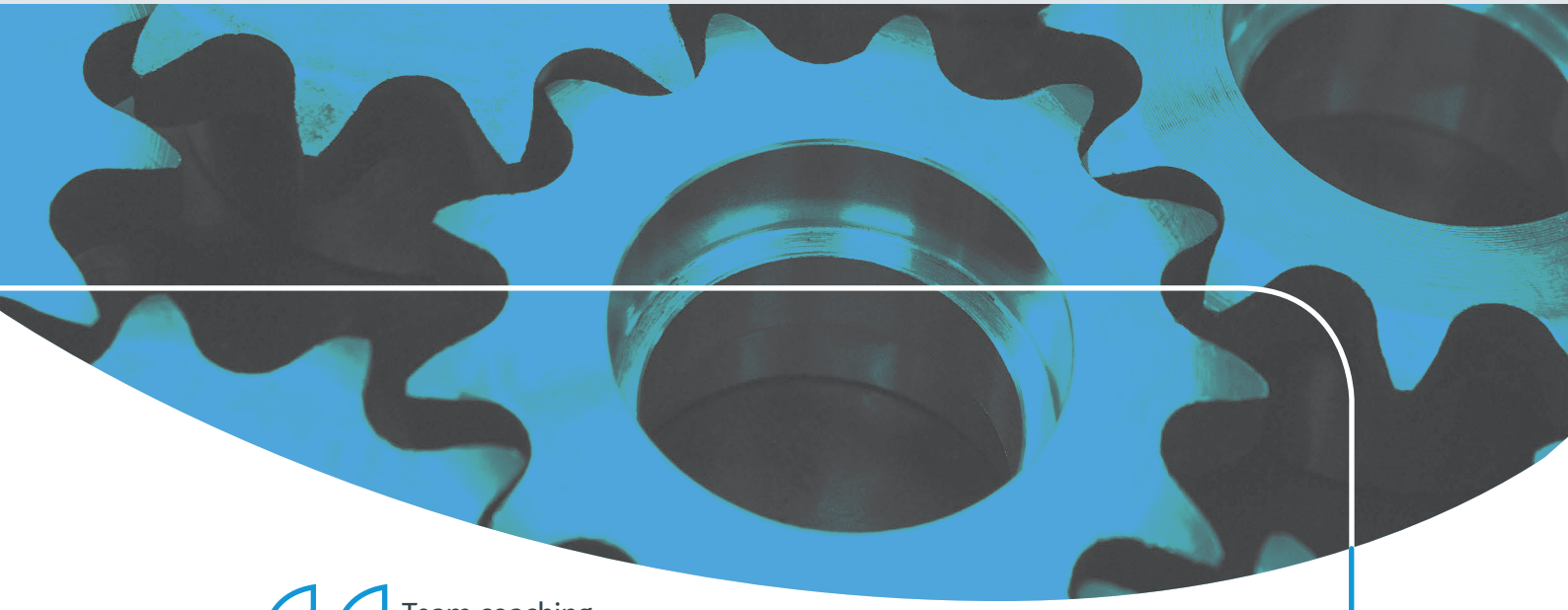
- Effective communications
- Adaptability
- Emotional intelligence
- Problem solving
- Conflict resolution

With so many standard forms of contract placing procurers and the supply chain in opposition, both commercially and legally, consultants should be ideally placed to bring an independent perspective to enhance the effectiveness of teams. However, many simply lack the skills or the inclination to either instigate effective team working at inception and/or contribute positively to effective team working once programmes or projects are underway.

Some consultants are fearful of any infringement of their professional indemnity insurance, whilst some in the Industry have somewhat cynically commented that it is against the interests of consultants to promote effective team working, as they can increase their remuneration from the 'blame and claim' culture outlined above. In addition, the fact that many consultants are not sufficiently conversant with the requisite 'soft skills' results in them only advising on what they know best, not necessarily on what is in their client's best interests.

Collaboration and in particular effective team working, is not wholly dependent upon best behaviours, although they clearly promote positive working attitudes, More important, we believe, is the ability to hold difficult conversations, without judgement and to 'confront issues without being confrontational'. Teams that are able to embrace conflict yet depersonalise debate, tend to solve issues and problems much quicker via more passionate debates.[8] Again, this situation is exacerbated by an inherent fear of legal proceedings and concerns regarding any infraction of the terms of professional indemnity insurance policies for example.

8 Lencioni, Patrick (2002), The FIVE Dysfunctions of a Team: A Leadership Fable, Jossey-Bass



> Team coaching will help to overcome many inherent dysfunctions.

Project Charters, either binding or non-binding, can be a valuable means of documenting alignment of team goals and objectives, supported by an unambiguous commitment to the application of behaviours consistent with the soft skills referenced above.

The greater use of a specialist role as team coach or collaboration facilitator

Teams that are too large do not work effectively; project teams in construction often have 'a cast of thousands'. Rather like the role of performance analysis in elite sport, the actual team is frequently outnumbered by 'non-players'.

Accordingly, in order to perform better, construction teams need to be smaller, with each member having an equal voice. Rotating the Chair at each meeting can assist this but there are many more fundamental issues to be addressed as regards effective team performance.

The construction industry is renowned for allocating roles to individuals within teams but at the same time, creating hard boundaries between those roles. The increasing use of technology and offshoring for example, places even greater emphasis on working effectively as a team and so to step-up from the status quo will take considerable effort. However, if the teams themselves create the framework within which they will operate, it is easier for everyone to abide by them.

Many teams are inherently dysfunctional; however, the breakthrough thinking to overcome these dysfunctions lies in the use of an independent person, not just to manage teams but to hold them to account and coach them through the myriad of challenges that they inevitably face.

An increasing number of standard forms of contact, most notably the PCC 2000, TPC 2005, contract and the Framework and Term alliancing contracts published by the Association of Consultant Architects, FAC-1 and TAC-1 respectively, provide for the use of a partnering adviser/alliance manager to improve the effectiveness of teams. In the draft NEC 4 Alliancing Contract, the Alliance Manager leads the Alliance Delivery team. However, many clients either elect not to appoint persons to these roles or otherwise perceive the role as being principally focussed on technical and operational issues, rather than including assisting teams to operate effectively.

Whilst it is not uncommon for individuals within teams to receive personal coaching, the structured (and effective) coaching of teams is far less prevalent. The performance coaching of teams is a discrete discipline, summarised in the following definition[9]:

"Project team coaching is the application of a series of interventions that enable a project team to develop and implement the collaborative behaviours required to deliver the desired outcomes of the stakeholders, to the performance standards that the team expect of themselves"

This definition neatly encapsulates the essential characteristics of effective team coaching:

- The role of the coach is to enable rather than to direct
- Effective collaboration is a fundamental prerequisite of high performance
- The coach is focused on helping the team to achieve the desired project outcomes, rather than on individuals
- The team itself decides the collective performance standards that it wishes to achieve
- The role of the coach can be part of, or distinct from, the role of project leadership

09 Llewellyn, Tony (2015), Performance Coaching for Complex Projects, Gower Publishing Limited

> The most effective teams take personal responsibility and ownership and understand how this contributes to the collective team effort

In some respects, team coaches can be said to be the 'conscience of the team', there to ask constructive yet challenging questions of the team and to help the team hold itself to account for its collective performance.

Some organisations outside property and construction have taken this role further and adopted the 'Corporate Fool' as "an indispensable amalgam of roles which stimulates effective change and resolution. The Fool is like the puzzle piece that fits in the strange, empty space in the heart of the company [or team]"; with the Fool, the picture is clear"[10]

The Fool is not a jester per se, though humour and levity can often be part of the role (see below). Rather, the Fool is there to act as an honest broker and hold the team to account, particularly in times of stress or conflict. David Firth[11] captures the essence of the Fool's role as follows:

- The Alienator, the representative of otherness
- The Confidante
- The Contrarian, challenger of the norms
- The Midwife, generator of creativity and problem-solving
- The Jester, entertainer and 'humourist'
- The Mapper, of knowledge
- The Mediator, of meaning
- The Satirist, deflator and "pricker of pomposity"
- The Truthseeker, teller of the truth
- The Mythologist, maker and breaker of myths

In order for the role to be truly effective, just as in William Shakespeare's King Lear, the Fool should not be punished or ostracised by the team for simply telling the truth, however unpalatable it may be.

One of the greatest benefits of either the team coach or Fool is that the person fulfilling that role can be open and candid without being judgemental as well as encourage all members of the team to be honest about their concerns and vulnerabilities, without being judged. Too often in construction, project team members are afraid of being offended or causing offence, rather than suppressing self-interest to concentrate on the facts and seek collective solutions; people are fearful of asking challenging questions if they don't think they will like the answer. Accordingly, we suggest that Industry teams need to change the paradigm and orientate around the team coach/Fool, exploring the role more fully and opening a space to think differently.

However, whilst the role of the team coach or Fool has proven to be very beneficial, it is vital that the person fulfilling that role, does not become the de facto leader of the team. The team must continue to be led by the appointed leader(s), avoiding the temptation for the team to lose focus when the team coach or Fool is not present.

The importance of effective leadership in improving effective team working

The US Navy Seals have a saying: "there are no bad teams', only bad leaders"[12]. Whilst that has been empirically proven, nevertheless it may be too absolute a proposition for many in the construction industry.

However, the importance of effective team leadership cannot be underestimated. Rather like a conductor and an orchestra, the most effective construction teams benefit from an effective leader who can coordinate their collective efforts and provide a strong sense of direction.

The most effective teams take personal responsibility and ownership and understand how this contributes to the collective team effort; in some instances team members might not even recognise when they are leading. The role of leader is not necessarily vested in a single individual and can be taken by a different member of the team at any point in the project team's life.

The most effective leaders are egoless and do not look for validation through the team. Their success is not predicated upon knowledge; it is about their emotional intelligence and ability to help the team manage disparate interests and competing agendas. Similarly, effective leaders create an environment within which teams can become almost self-sustaining and are not wholly dependent upon the leader for direction or advice. In the best performing teams, leaders are not omnipotent; they can't possibly know everything and it can become corrosive and ineffective if a team looks to a single person all of the time.

10 Firth, David (2010), The Corporate Fool
11 Firth, David (2010), The Corporate Fool
12 Willink, J and Babin, L (2015), Extreme Ownership; How US Navy Seals Lead and Win, St. Martin's Press, New York

Whilst strong leadership is vital, so is knowing both when to lead and when to follow. Followership, the capacity of an individual to actively follow a leader, is the reciprocal social process of leadership. A comprehensive understanding of followership, in-turn promotes a greater appreciation of the characteristics of effective leaders.

For some, the success of teams is based upon the paradoxical need for team members to be able to follow effectively, yet demonstrate highly effective leadership at key points in the project life-cycle. Highly effective followers tend to be enthusiastic, committed and self-reliant; they also demonstrate a strong work ethic both as individuals and in their desire for the team to succeed.

Effective leaders need to be sympathetic to the view that the financial "bottom line" drives behaviour. Clearly, financial performance is a key motivator for any member organisation in a construction team. However, strong leaders do not allow that to detract from achieving the overall project objectives. That said, the bottom line can be the catalyst for the greatest momentum to change.

The construction industry is beset with inertia. Change in the Industry generally happens because something has already gone wrong; change because it's the right thing to do seems so much harder to achieve. In that context, some in the Industry feel that they need to consider what are the consequences of not changing and if there are none, why would they change? Put another way, why be brave enough to change the equilibrium if there are no consequences of not changing?

To overcome that inertia, the Industry needs strong leaders to drive the change. If the ultimate client sets the environment within which to collaborate in a particular way, it is easier to drive the change. It is more difficult for contractors to drive that change up the line as well as down the line to its supply chain.

So where does the ability to influence teams' desire to work effectively and collaboratively stem from? Whilst there are notable examples of where such initiatives have been promoted by tier 1 contractors and supply chains, the considered view is that clients' are best placed to initiate and lead collaborative working practices. Often, the best-performing teams are those where the supply chain is engaged early and led by a client with the necessary vision and resources.

That principle applies equally where the contractors are the 'client' to their supply chain partners; often, contractors are clients to many more suppliers than any ultimate client on a project, for example the Network Rail frameworks, where it is the ultimate client but where a multitude of suppliers work closely with tier 1 who are in-turn contracted to Network Rail. It must be acknowledged that the supply side of the Industry is often just as capable and conversant, if not more so regarding collaboration, as the client.

The importance of choosing the 'right team members' in the first place

Whilst clients continue to select successful bidding organisations on the basis of their credentials, competitiveness etc., increasingly, they are selecting the best combination of key individuals and then developing them into cohesive teams.

It has to be acknowledged however, that this remains a maturing aspect in the selection and development of effective teams; in the majority of instances, clients are dependent upon the successful bidders honouring commitments made during the tender process and the veracity of statements made regarding the capabilities and experience of proposed personnel.

> Change in the Industry generally happens because something has already gone wrong; change because it's the right thing to do seems so much harder to achieve.

A key issue that is also referenced elsewhere in this Report, is the frequent disconnect between those contractor personnel involved in winning work and those more actively engaged in delivering it. Rather like a 4x100m athletics relay, the smooth handover of the baton is imperative to success. Accordingly, this principle places a significant emphasis on the mobilisation period as an opportunity to commence the team development process.

Anecdotal yet compelling evidence, reinforces the importance of early engagement with Tier 1 and other supply chain members as an opportunity to instil the required values and behaviours that are so fundamentally important to effective team working. That said, the same observations can and should apply to those representing client organisations, with a particular emphasis on the unambiguous articulation and sharing of desired visions for a project or programme, together with the key deliverables and benefits sought.

As a result some clients, especially those involved in substantial infrastructure programmes, are utilising psychometric profiling and similar tools to secure the best blend of team personnel. Tools such as SDI® (Strength Deployment Inventory®), are becoming more widely used as a means of better understanding and influencing the motives that drive behaviours, as well as managing conflict.

Diversity is another important factor in the achieving the optimum blend of team personnel. Be it gender, ethnic or cultural, diverse team membership can promote enhanced pragmatism and different perspectives, especially in situations of conflict or where focused problem-solving is required.

For example, women regrettably remain under-represented in many aspects of the construction industry but their positive influence can be vital to effective team performance. A brief survey of several female quantity surveyors, a fast-jet pilot and a business coach, revealed specific references to an enhanced ability to reflect, a greater preparedness to admit mistakes and the benefits of females' ability to process information differently than males and offer pragmatic solutions.

Industry Leadership

Spotlight

- Disruptors and innovators will demand change from the Industry and will be catalysts for change
- There is a need for an Industry-wide representational body, perhaps by enhancing the role and influence of The Construction Leadership Council
- Investment is needed in centres of excellence for collaborative working methods; they are necessary to collate data and evidence
- More support and direction is needed from Government, professional bodies and educators
- Educators and training professionals are key to more holistic training and a greater understanding of the contributions of all players

Overview

In our first Report, we identified leadership as a key challenge for the Industry. We concluded that "It would be hard to deny that the calibre of leadership within the Industry must improve in order that the benefits of collaborative working can be fully exploited. There are simply too few high calibre leaders who can create and maintain the environment within which teams and key individuals can work effectively towards a common purpose, free from judgement and the commercial distractions that pervade so many project teams".

We also concluded that "Whilst the government can play its part in the public sector, we argue that for collaboration to truly succeed it is the major clients that are best positioned to lead the necessary agenda for change outlined in this report". In addition we stated that "those leading project or programme teams, must be acutely aware [of] the importance of understanding how highly effective teams really work and be prepared to become just as confident and capable in managing the dynamics of multi-disciplinary teams as they are in managing the commercial, legal and operational aspects."

The construction industry is, by its nature, highly fragmented.

After our report was published, we were encouraged that the CLC (Construction Leadership Council) Commissioned Report by Mark Farmer, Modernise or Die[13], echoed many of the themes in our first report. In particular, his report observed that "related to the structural fragmentation issues ….. is the highly fragmented nature of leadership and decision making in the Industry. This is underlined by a fundamental lack of collective responsibility for change and improvement across all stakeholders involved in built asset creation, modification and operations".

In addition, he also commented that "There is no single large scale representative body that represents both industry and clients across all types" and that the CLC, "does not have a wider mandate to represent and lead on behalf of the collective industry and its clients; the industry's own representative bodies are generally highly fragmented and, by implication, often serve only particular sub-sets of the industry due to the priority being their own members' interests."

The Farmer Report includes the following recommendations relating to leadership:

- "Integrated Tripartite Leadership across clients, government and industry – at the heart of these recommendations is the need to establish a new tripartite covenant between the construction industry, its end clients and government which leads to mutual benefit for all parties; it (the CLC) represents the logical choice of platform from which the longer term dedicated executive and fully integrated leadership vehicle may possibly evolve."

- "The CLC should have strategic oversight of the implementation of these recommendations and evolve itself appropriately to co-ordinate and drive the process of delivering the required industry change programme set out in this review."

Our own leadership working group has looked closely at the issues identified in our first collaborative construction report and considered these in the context of the Farmer Report. We have developed a number of observations, conclusions and recommendations in relation to the various directions from which we consider that leadership should come or may emerge.

Industry bodies/leadership groups

The construction industry is, by its nature, highly fragmented and, unlike other industries, it has traditionally proved extremely difficult to establish any pan-industry group which is truly representative of the whole industry. It is therefore difficult for the Industry to unite behind any group or body which might lead the Industry in promoting a move towards more collaborative working.

We support the view that The Construction Leadership Council (CLC) is generally considered to be the group which has, perhaps the broadest representation of the key stakeholders within the Industry and has the greatest level of access to Government. Accordingly, we therefore agree with the conclusion formed by Mark Farmer, namely that the CLC has the potential to become the platform from which a fully integrated leadership vehicle could evolve.

Of course, other umbrella bodies representing various sectors of the industry endeavour to speak for a wide community of interests. Build UK, for example, is an umbrella organisation representing clients, main contractors and trade associations, in-turn representing numerous specialist contractors and other organisations delivering in excess of 40% of UK construction value

Other organisations such as the CBI Construction Council, the CIC and JCT also attempt to straddle industry sub-sectors but none can truly claim to speak for the whole of the Industry. Furthermore, the many other trade bodies which exist in the construction sector have relatively narrow remits and naturally represent vested interests.

We share the view expressed in the Farmer Report that the CLC is probably the body which is best positioned and has the best prospect of representing the interests of the industry and interfacing with Government in order to lead the change agenda. However, we are conscious of the limitations of the current structure and resourcing of the CLC. It currently meets only three or four times a year for a few hours on each occasion and therefore has very little time to consider and discuss anything other than pressing events or issues of the day such as Brexit. It also has extremely limited

13 The Farmer Review of the UK Construction Labour Model - "Modernise or Die: Time to decide the industry's future", Mark Farmer, October 2016

administrative support, research facilities and funding. Furthermore whilst its membership is broader than most umbrella bodies, its members are appointed as leading individual industry figures rather than representatives of specific industry bodies or organisations.

We consider that to be truly effective, the CLC needs to demonstrate greater democracy in the appointment or election of its members and that the membership needs to be increasingly diverse and pan-industry; for example, greater representation from major private sector clients would give it significantly greater cross industry credibility. Taking the appointment or election process away from Government and establishing a separate nominations or elections process, might also enable the CLC to have greater pan industry credibility and influence, particularly if CLC members were to be nominated or appointed by key umbrella or professional bodies who may be prepared to contribute towards increased funding of the CLC in exchange for a place on the Council.

By way of example, our working group considered that additional representation on CLC from the CIC, Build UK, CPA (Construction Products Association) and the Construction Alliance may well help to improve and expand CLC's representational constituency.

If it were to function as described above, the CLC must be better resourced and funded if it is to have the ability to develop and research its own agenda in future as well as to react to issues on which government requests its input. Such resourcing should include easy access to academic research and support on best practice and innovation from Centres of Excellence such as NBS, Constructing Excellence and academic institutions.

Greater resource and funding would enable the CLC to develop a proactive agenda which looks ahead to the productivity improvements which are necessary to underpin the development of a modern, technology enabled industry.

Although a more powerful consolidated representative body would undoubtedly help to provide the tripartite integrated leadership between clients, Government and the Industry which the Industry needs to develop, we take the view that it is unlikely that the desired objectives would be achieved speedily enough to avoid being overtaken by events.

In reality, we consider that, in the shorter term, changes in working practices are more likely to be forced upon the Industry by disruptors and enlightened clients who will require contractors, professionals and the Industry supply chain to respond to demands to utilise and embrace the benefits of new technology. In the longer term, however, the establishment of an Industry wide representational body with close links to Government and with the ability to speak with one voice, has to be a priority.

Role of Government

Clearly, Government is a crucial enabler for change in its role both as a regulator and also as a major client of the construction industry. However, whilst it currently procures across a wide range of agents at both National and local level, it does so with little consistency or continuity of approach. The Government needs to improve the way in which it procures and commissions design and construction operations via its various agents with a view to achieving a far greater consistency of approach and demonstrating that it is practicing what it is preaching.

As a tangible example of sector leadership, in January 2014, the Government published guidance on 'new models of construction procurement'[14], specially focused on Two-stage Open Book, Cost-led Procurement and Integrated Project Insurance, with the aim of "trialing new models of procurement that include principles of early supplier engagement, transparency of cost, integrated team working and collaborative working". The public sector take-up of these models is being monitored through a series of trial projects, with assistance from Constructing Excellence.

Furthermore, although Government can have a significant influence over the Industry through its procurement of public sector projects, it has no real influence on private sector clients and has limited ability to impact on the development of new procurement models, skills and techniques other than by its own example and also by active encouragement and sponsorship of related Industry initiatives.

We consider therefore, that Government needs to become an economic enabler recognising that the long term good health and prosperity of the construction industry is fundamental also to the strength of the UK economy; its leadership needs to be clear, pro-active, benevolent and enlightened.

Government needs to connect with the Industry and has to demonstrate that it really wants to make the Industry work better and be more successful. It needs to practice what it preaches and encourage the Industry to come together and embrace change, as well as encouraging and enabling disruptors to flourish and to remove barriers where possible.

We also consider that Government can play a major part in helping to demonstrate the benefits to the Industry and to the UK economy of a collaborative, technology-enabled approach to construction and to promote centres of excellence and to spearhead change. The work which the Government has done in relation to BIM through the BIM task group is perhaps an exemplar for this approach.

The demise of the role of Chief Construction Adviser following the completion of Peter Hansford's term of office, the reduction in the number of civil servants with a construction sector brief and the continual ministerial changes over the last few years has been unhelpful for the Industry. They have had the effect of reducing the impetus of the change agenda and have done little to demonstrate the Government's commitment to assisting the Industry in the implementation of the change agenda.

We consider that a sustained and coordinated follow-up of the work carried out or initiated by Government through BIS and BEIS under previous Chief Construction Advisors would be desirable so that the Industry can benefit from the good work carried out by, for example, the BIM Task Force and UK BIM Alliance as well as the recommendations in the Digital Built Britain Report.

Industry professionals

Professionals supporting and advising the Industry will need to redefine their roles and embrace new technology and collaborative structures and techniques. This will require professional bodies such as RICS, ICE and RIBA to look closely at the changing roles which their members are likely to have in future and to equip them for those roles through revised and enhanced training and professional development programmes, which are much broader and less "siloed" in approach.

Those professionals advising construction clients at the outset of prospective new projects, need to have a broader perspective on the Industry and to provide proactive and well informed advice on the relative merits of different approaches to procurement including the use of BIM and collaborative structures and techniques.

In our view, construction industry professionals tend to be reluctant to suggest approaches which are unfamiliar to them or of which they have little personal experience. There is also a fear of the unknown and a natural tendency to resort to tried and tested structures where there is greater certainty in relation to time input and fee structures.

14 Cabinet Office (January 2014), New Models of Construction Procurement, Gov.UK

Funders

The finance industry naturally tends to operate in a world which revolves around its own regulation, benchmarks and risk criteria. We believe that finance industry professionals need to strive to understand more about the Industry and the procurement, design and construction processes, in order to appreciate the potential benefits of an approach to funding and risk management which embraces collaborative techniques and attempts to remove risk through collaboration rather than passing risk down through the supply chain.

As the Industry develops more sophisticated methods of measuring performance and outputs, including lifecycle, operation and maintenance costs, the finance sector needs to consider developing new approaches to measuring financial success and valuing the true cost of an asset over its whole life cycle performance, rather than the initial design and construction cost.

Educators and training professionals

We believe that education lies at the heart of changed leadership; graduate networks need to work more effectively at joining up the dots between the various professions, in order to provide more holistic experience and training for those entering the Industry.

Ultimately, the Industry will need younger professionals who truly understand the benefits of and potential for technology, not just in their segment of the Industry but more widely in the design, construction and operation of built assets; this will include issues such as modular construction and smart technologies for example. They will become the disruptors and innovators of the future.

In summary, educators need to help future industry professionals to have their eyes opened to the work which other professionals in the Industry do and why the Industry operates in the way that it does. They need to be encouraged to challenge and to look at the ways in which their generation can embrace change for the better.

Centres of excellence

We are firmly of the view that building on and investing in, current centres of excellence is crucial to a greater awareness of and confidence in, the benefits of embracing technology, new construction methods such as offsite manufacturing and collaborative structures and techniques.

Many UK centres of excellence such as Reading, Loughborough, Salford and Kings College Universities together with organisations such as Constructing Excellence, already carry out first class work in collating information which is of considerable value and needs to be more widely available to the Industry as a whole.

There is hard evidence that new approaches to procurement and construction can not only result in more efficient and cost effective design and construction but can also reduce whole life cycle costs and will ultimately influence funders, industry professionals and clients in their choices of procurement routes, use of technology and new construction methods .

Disruptors and innovators

We consider that the Industry is unlikely to embrace change at a speed which is going to meet the demands of its more enlightened clients. We therefore reached the conclusion that it is those forward thinking clients who are more likely to become the disruptors and innovators of the Industry and who are likely to force change on the Industry in the short to medium term.

Progressive and innovative procurers anxious to capitalise on the benefits of new technologies and more collaborative approaches, are likely to require the Industry to better respond to their aspirations and expectations; it is those organisations with the biggest budgets and portfolios of future work that will have the ability to lead the way and effect long-term change.

We are already seeing clients such as Legal and General and Berkeley Group looking into large scale factory based house building techniques and we have also seen the large utilities such as the water and rail companies, successfully procuring construction and infrastructure using collaborative techniques such as alliancing. Major developers are also likely to exercise their influence on the Industry, especially as the investment market becomes more interested in the whole lifecycle cost of assets and in particular, as rental value starts to reflect whole lifecycle costs.

Innovators and disruptors may also emerge in the form of larger global consulting groups and major international contracting groups offering turnkey packages to clients.

Chief executives and leading Industry figures
There is no doubt that strong high profile individual corporate leaders can have a real impact on the Industry. However, leaders of public companies often tend to be stifled by the demands of the City and corporate shareholders and are often unwilling to disturb the status quo and to publicly advocate change in their organisations, only to risk creating economical market uncertainty.

Whilst there are notable exceptions, leaders of private companies are more likely to feel able to advocate change and espouse a more visionary approach. Major consultants can also be genuine beacons for change.

However, we consider that the greatest catalyst for change is likely to come from leaders of major Industry clients including the larger developers whose regular high value business is of great attraction to contractors, professionals and the supply chain. It is the leaders of those businesses, whose guidance and expressions of their requirements, are most likely to be listened to by those who are more reluctant to embrace change.

Arguably, however, recruiting breakthrough thinking from other industry sectors will be even more valuable. The Industry needs to recruit leaders more widely, so that best practice can be better harnessed. The high-volume motor industry is a case in point; it routinely utilises fully integrated supply chains and leading sector figures such as Sir John Egan and David Higgins, have advocated fresh thinking.

Concluding thoughts

Leadership is an essential ingredient for a step change to more collaborative behaviours.

Our conclusion is that there is no one silver bullet which provide leadership overnight and for the long term. Our strong view is that human leadership at all levels is desperately needed and has to be a priority for the Industry. However, perhaps the biggest driver for change, will be the availability of clear and compelling evidence of the impact of technology, smart technology and collaborative techniques, on the quality of design and construction and, most importantly, on ultimate user experience and operational efficiency and cost.

Feedback from end users of built assets which have been delivered using collaborative techniques will ultimately be the key to changing long term behaviours and the Industry needs to capture that feedback and ensure that it is held in centres of excellence and disseminated widely.

Ultimately, change is likely to come from organisations with big budgets, big portfolios of work for the Industry and the ability to control procurement and demand and thereby effect real change. As more of those organisations are convinced of the desirability of changing their approach and practices, the sooner the Industry will recognise that change is both necessary and inevitable.

As commercial and other built assets start to be valued and judged on the basis of their design, operational performance, operational experience and operational cost as well as the upfront design and construction costs, the benefits of a collaborative approach will become increasingly clear and sustained change will follow.

> To collaborate is to contract for success as opposed to 'contracting for failure'.

Contractual Structures and Changing Risk Profiles

Spotlight

- To collaborate is to contract for success; the Industry must avoid its overwhelming focus on dealing with failure
- Better defining value is critical
- The Industry must focus on true alignment of interests; incentivising for success is much better than penalising for failure
- More reliable cost databases will enhance confidence in expenditure commitments
- Early engagement with contractors is crucial
- True collaboration requires equitable sharing of risks and fair incentivisation

Overview

The construction industry has a continuing reputation for being adversarial, whilst standard forms of contract have evolved over time to become more complex, to take account of increasing legislation and case law.

Within any construction project, it has to be recognised that there is limited ability to rewrite significantly, the key obligations of contractors and designers. Contractors will continue to need to build to the standards set out in the tender documentation, whilst if a client delays the project, then the contractor will be entitled to an extension of time and professionals' indemnity insurance will require that design and professional services are undertaken with reasonable skill and care.

That said, there appears to be a growing recognition that collaborative behaviours are one of the keys to successful outcomes to projects. Certainly, the NEC appears to have embraced collaboration more fully, as evidenced by the publication of a consultative version of its proposed alliancing contract.

Alliancing is the widest form of collaboration; some say that it is radical, in that in its truest form for example, the parties undertake not to bring proceedings against each other for breaches of contract (other than for non-payment and other limited circumstances). This is the basis of the alliancing model adopted by Network Rail and the intention of the draft NEC alliancing contract. Whilst it is recognised that alliancing is not suited to every project, certain aspects of alliancing can be adapted and utilised on many projects to create more collaborative structures.

To collaborate, is to contract for success as opposed to 'contracting for failure'. Too many contracts are set up to deal with failure, supported by a schedule of amendments to a standard form contract. By this we mean that there is an inappropriate transfer of risk and mechanisms which seek to apportion blame and liability when issues and errors occur. Positive and more collaborative behaviours are not accentuated.

> Too often budgets are set using cost information which is out of date.

Whilst there are a number of constraints arising from these legal and commercial factors, we nevertheless examined what changes could be made at various stages of a project which would facilitate effective collaboration, ranging from project inception through the tender stages, to construction.

Planning the project

Both owner-occupiers and end-users, live with the consequences of what is being built and what has been specified; accordingly there should be a culture of clients sharing in the risks of construction, rather than all of the risk being passed to the contractor without any incentives.

Consequently, greater consideration needs to be given to the team which is assembled at the project planning stage. For example, the client's maintenance and management team who will look after the assets following completion, should be an integral part of the planning and strategic design processes. This enables the brief to be more fully defined at the outset and prevents potentially time consuming and expensive changes at a later juncture, when the operational and maintenance teams become involved, or the building being constructed in a way that is not optimised for operational purposes.

Clients need to document and quantify their precise requirements before they commence the tender process, whilst also focusing on the out-turn solutions; this will better inform the procurement process and the timing and nature of the tender. Once the tender process commences, the opportunity to structure the project advantageously is lost, obviating or reducing the benefits of collaborative working.

Facilitation of the project strategy should be undertaken by a third party professional as part of the pre tender advisory process. The investment target should not just be a capital target; there needs to be an understanding of rates of return based on the generation of income, thereby creating a wider appreciation of what are the value and success factors for the project. For owner/ occupiers, this should also include a focus on the operation and maintenance of the building.

Budget and costs information

A fundamental issue that leads to the potential for disputes is managing clients' expectations as to what they can expect for their budget. Too often, budgets are set using cost information which is out of date. The best means of ensuring that a project is properly designed and creating value, is to engage with the specialists in their respective fields at the outset.

Whilst designing to a price is achievable, very rarely does a client ask what can be designed and achieved for that budget. Clients' expectations of what they will receive for that budget are not managed and this can be exacerbated by using out of date cost data.

Generally, contractors and the supply chain understand the build-up and expenditure of costs better than the professional team, yet a major issue for the Industry is that it does not share out-turn cost information well enough. Many contractors also do not seem to have internal systems to compare and share out-turn cost data against their pricing, even from their delivery teams to their pre-construction and bid teams. By not sharing this information internally, contractors' delivery teams prevent their own bidding teams from pricing on the basis of what were realistic and profitable rates on previous projects.

Basis of tendering

For a project to be collaborative, any tender selection process should establish which team is best placed to undertake a project; tenders all too frequently have an over-emphasis on price as part of the selection criteria. Accordingly, the result often favours the team which will take the most risk, rather than the one best suited to carrying out the project.

The writing of specifications seems to betray a lack of understanding of the product or processes, since those who write them, do not fully understand the technical processes. Specification writing is a skill which is being lost (along with the measurement of quantities), neither of which are being taught in detail anymore, yet are the key to accurate pricing of projects, even with the advent of BIM and electronic measurement.

There are insufficient checks on design information before it is sent out. Costs and time pressures mean that efficiencies are neither driven nor found, caused by not having the design and implementation teams working together.

The emphasis in tender criteria ought to be on what constitutes long-term, wider value for the project, rather than price. An example is Network Rail's value for money statements, which are their client's requirements; using minimum conditions of satisfaction can set out the client's four or five key categories where they require a positive outcome, thereby creating an environment for a disciplined approach from all stakeholders. Additionally, this approach enables the calculation of an informed contingency within the contract price, as the key risks are fully discussed and understood at tender stage.

Early supply chain involvement

Contractors and supply chains that deliver projects are best placed to add significant value in the design stages; the optimum time for a contractor to become engaged is soon after the outline design stages.

Currently, by the time of a contractor's appointment, too many issues have been established; if the contractor's engagement is made as soon as possible, the separation of design and construction is minimised. This is a key issue and a major challenge but nevertheless, developing an integrated solution is the key to project success.

There are a number of issues for wider stakeholders to address, not least the insurance models which are based on a sequential arrangements. The earlier the contractor is engaged, the more practical input there can be in relation to the strategic brief, investment target and the target cost, as well as the ability to reduce the risks associated with inaccurate project budgeting.

Aligned to this, tier 1 contractors should engage, at the tendering stage, with the key elements of the supply chain. As suppliers and specialists in tier 2 and below can easily account for 70% to 80% of expenditure on a construction project, the majority of the understanding and value can be gained from this early specialist engagement.

By tendering earlier, it becomes easier for skills and capability to be the key tendering issues rather than price. Following selection, there can therefore be an integrated approach to the development and management of value during the detailed design phase.

> The optimum time for a contractor to become engaged is soon after the outline design stages.

Use of competing bidders' information

For a client wanting to hold teams in competition, one solution is to retain and pay the best bidders for the work they produce during the tender stage until the preferred bidder is decided. The consideration for payment of bidders is that the client will be entitled to utilise the ideas and solutions of the losing bidder(s) if they are found to create value for the project.

The successful delivery of this approach will rely on a complementary set of behaviours to ensure ideas and solutions are not held back to a later stage of the bidding process. There may be resistance to this idea, unless it is clear that the losing bidders cannot have any liability for their design being used by the client and the successful team.

Large scale infrastructure projects involving public funds are those where collaboration has been most used. However, the EU Procurement Directives and Regulations can create a barrier to seamless early contractor involvement. In contrast to the private sector, where contractors have been involved in assisting public sector clients in the early stages of a project by establishing costs etc., that contractor can potentially then be precluded from bidding for the actual scheme, with the resultant wastage of the intellectual capital and planning that has already been paid for.

> In order to drive collaborative behaviours the interests of all parties must be aligned.

Perhaps one of the consequences of Brexit will be a re-appraisal of the procurement regulations, such that a contractor who has assisted in the early stages is not precluded from bidding for the work.

Alignment of interests

In order to drive collaborative behaviours, the interests of all of the all parties must be aligned. Currently, in bi-lateral contracts, incentives tend to focus on the relationship between the client and main contractor to the detriment of others involved in the project.

This leads to a focus on what those parties want or need to get out of the project rather than what the wider team (and therefore the project) needs to succeed. In short, incentivisation in a bi-lateral contract does not necessarily benefit the rest of the project relationships, some of which will be of fundamental importance to the success or failure of a project.

We see the following issues that need to be considered:

- Collaboration in the lump sum environment and standard forms

  The majority of standard form contracts do not create a collaborative environment, nor do they incentivise contractors or professionals. Whilst the position can be improved by utilising various support processes such as BS11000 (ISO 44001), risk management plans and behavioural workshops, without equitable sharing of risk, it is difficult to collaborate fully.

  In relation to standard form contracts and contractual structures, there is very little mechanism for incentives. The details for incentives are generally not spelled out; in addition, the expressions used tend to focus on the negative, i.e. referring to "pain/gain" rather than "gain/pain".

  A practical difficulty of target cost contracting is in tendering; contractors will assume the project will succeed and they will make some gain. Consequently, the declared/ tendered margin is discounted, masking the true margin on successful bids.

  The draft NEC Alliance contract addresses this in part by not being a target cost contract per se. Payment is on a cost reimbursable basis and the parties share in incentives against a range of key performance indicators, only one of which is likely to be not exceeding the project budget.

  In some respects, this may mean that performance against costs is not at the heart of the contract and other factors can create a balanced scorecard. This is a variation on the concept of non-financial key result areas modifying gainshare and painshare which has been utilised, for example, by Network Rail in its alliance agreements.

- How do you ensure the correct behaviours?

  There has to be a common alignment of the parties' interests, with each project needing to establish the appropriate behaviours. We consider that a key appointment on a collaborative project is for a behavioural advisor, who advises on what behaviours, processes and alignment are required in order for a project to succeed (see also the Effective Team Working section above).

  This "cultural advisor" role must therefore be sufficiently independent to influence the correct behaviours. At the outset, even before engaging with the team, there will be the need for the cultural advisor to explain the benefits of collaboration to the client. The cultural advisor will need to define the outputs necessary to achieve success and monitor compliance against these objectives throughout the project. Via mentoring and coaching interventions, the cultural advisor needs to be empowered to hold the Team to account and ultimately, to encourage the team to hold itself to account. The position must be independent and powerful. We see this as wider than the partnering adviser role in the ACA/PPC forms of contract and is not currently a feature of the draft NEC alliancing contract.

  However, there is a distinction between this role and that of a project board. The board is charged with successfully delivering a project from a technical, financial and programming perspective. Even in full alliancing structures where the project board needs to resolve unanimously issues on a best for project basis, there is the need to hold the board to account. The cultural advisor role can be used whether a board is engaged or not.

> We advocate the widespread adoption of multi-skilled site visits, since they materially alter the way information is viewed and utilised.

On long term projects, key individuals can either join or leave a project. The cultural advisor role can ensure that any transitions are seamless as they will have the knowledge and continuity within the project and can act as the guardian of the project's principles.

Success in the role can be measured by the role becoming redundant if the mentor has succeeded in embedding the collaborative behaviours throughout the project.

To facilitate the alignment of the various stakeholders and to assist the cultural advisor, consideration should be given to the following two key issues:

1. Principles based contracts and contractual approach to team selection:
   As well as dealing with risk, contracts should embody principles and values and be business led rather than be process driven or term related. This is the conundrum at the heart of collaboration.

   In addition to the cultural advisor, consideration should be given to the contract terms including procedures for team selection for a collaborative model and enabling training regarding what the collaborative model entails. There is clearly a time and programming issue, so early contractor involvement facilitates these processes.

   In order to accommodate this proposition, contracts will need to be let in the pre-contract stage, so that team selection is undertaken prior to project start or provisions will need to be included in a pre-construction agreement.

   Collaboration is about creative tension and how parties or team members act when there are difficulties. There is a need to move away from relying upon strict legal positions, and how parties have customarily reacted to each other when there are disagreements over cost, quality and time.

   No contract prescribes how to select the team. There are often clauses regarding removal or non-removal of key team members but at the heart of successful projects are the people who make these happen. Generally contracts deal with time cost and quality and do not focus on team structures, their engagement and collaborative behaviour. We argue that there need to be more mechanisms for reviewing the progress of team building and that contracts should contain obligations for associated regular interventions such as workshops.

2. Facilitators/workshops:
   The cultural advisor's role is to establish the right behaviours and then drive these through the supply chain and also to assist the project team in the management of the client and its expectations.

   An important issue is whether a project has sufficient funding for the workshops advocated above but on any long-duration project, there needs to be a recognition that over time there will be various challenges requiring resolution. An early commitment to collaboration is likely to have value in embedding the culture of collaboration, which will then engender savings over the longer term.

   Such workshops should involve the project's management and two tiers of supply chain where there should be discussion and agreement of key issues by all parties. Attendance at workshops should be mandatory. Project costs should be considered rather than individual organisations' costs.

   It is also important that suppliers attend progress meetings as these create a forum for all parties to discuss progress and current issues. However, the practical difficulty of this is that contractors might be tempted to brief suppliers on their tactical position beforehand.

   We advocate the widespread adoption of multi-skilled site visits, since they materially alter the way information is viewed and utilised. Such visits may lead to alterations to design prior to project commencement. Similarly "build in a day" workshops with 3D or 4D models together with the assessment of programming, enables projects to obtain feedback and change the programmes to create efficiencies.

   Joint risk management workshops are also key interventions. The parties should work through a fully detailed risk register to discuss how each risk is managed, reduced or eliminated. There needs to be consideration of how each risk will be resolved and if the proposed solution is workable.

> True project management requires the project manager to be capable of being assertive with both the contractor and the client.

Once the risk register is established, the parties need to be encouraged to assist in the resolution of that risk to all parties' advantage. This reflects one of the approaches underpinning NEC early warning meetings where solutions to risks are sought which bring advantages to all parties.

- Alignment of the client's key advisors

We consider that project managers administering contracts are seldom sensitive to the contract or the project. True project management requires the project manager to be capable of being assertive with both the contractor and the client. Weaker project managers do not tend to impose the discipline upon their client as the project manager role has evolved into acting as the client's agent. This creates an inherent conflict of interest between acting in the best interests of the client and on a "best for project" basis.

There needs to be a return to assertive project management and greater freedom for project managers to be even handed and to deliver for the project as a whole, rather solely for the client's interests. This issue is more acute in traditional contracts than in alliancing, where much of the project management function can be devolved to the alliance board and alliance project director.

In the Integrated Project Insurance (IPI) model, the alliance manager has a stake in the success of the project. This contrasts with traditional contracts where the interests of the project manager are not aligned with the success of the project as a whole.

Similarly quantity surveyors are not accountable for outturn costs. The PQS used to have independence and look after the project as a whole but they find it increasingly difficult, in the face of client demands, to provide wholly impartial advice. The dual role of quantity surveyors also being the project managers is unhelpful since it leads to excessive focus on costs to the detriment of other aspects of the project. Cost plans can be drafted a couple of years in advance of project commencement and by the time the project starts, these projections are often significantly out of date.

Bearing in mind the importance of good design to the success of a project, mechanisms should be found to incentivise designers. If the structure permits, they should be engaged at tier 1. Under traditional professional indemnity insurance arrangements, there may be perceived risks of tier 1 design obligations creating fitness for purpose obligations with consequences for the validity of their professional indemnity insurance.

Although clients will not want to dilute the market obligations under construction contracts, potential solutions can include no claims provisions and the IPI model (see below), where the project contains an element of gain/pain. Designers should be incentivised as part of the supply chain.

- Supply chain alignment and engagement

Experience suggests that main contractors generally pass-on all main contract terms into the provisions of sub-contracts and add their own domestic, additional risks. In part, this has been as a result of the pre-eminence of design and construct as a procurement route. Since the abolition of the nominated sub-contractor regime, clients have shown less concern as to who is engaged to undertake the key packages and generally the main contractor chooses who will undertake these works.

Since main contractors do very little work directly, the reduction of client concern in who actually is engaged to do the work, is contradictory and lessens their control, it is also not conducive to collaboration as it concentrates the relationship at tier 1. In the light of our comments on the alignment of key advisers above, consideration needs to be given as to which professional discipline can fulfil this role effectively

It is important to incentivise the supply chain if it is willing. However, there needs to be a realistic assessment as to whether there may be insufficient margin in the project to enable this to happen effectively. Incentives need to cascade through the supply chain, such that those who assist in the pricing and delivery of work successfully, also share in the benefits.

The time and effort required for vertical alignment of project risks is underestimated as a challenge. Sophisticated clients will want to know the maturity of the supply chain but there are a number of issues and barriers which need to be addressed by main contractors to align the supply chain.

One of the ways for the main contractor to collaborate with the key supply chain members is to create a limited number of preferred parties in specialist disciplines who will assist the contractor on all their projects over a lengthy period. Long term collaboration enables contractors to address the tendency to pass all risk through the supply chain as noted above.

Strong contractors retain certain risks rather than transferring all risk, whilst commitment to long term performance and delivery, engenders trust within the supply chain. However, it is important to ensure that there isn't any disconnect of risk and reward between the main contractor and the subcontractors.

Informed clients will want to see alignment through the supply chain. They will have the market knowledge to influence which supply chain members they want to use because of quality being a key issue. (This is in contrast to the customer who builds on a one-off basis and will be reliant on professional advice to secure quality). In order to engender the right skill set, a member of the professional team must be responsible for advising as to whether this alignment has occurred.

Clients need to understand that construction is not a commodity purchase. The right processes need to be applied so that the client can see how the main contract has been let and the appropriate risks and terms have been applied across the project. The client will want to see that the project's aims are reflected across the whole supply chain. In particular if key client objectives contained in the main contract relate to payment terms and use of apprentices for example, these can be monitored throughout the supply chain to ensure that the contractor has complied.

There also needs to be greater understanding of the impact of "fee on fee" for contractors using a group company as a sub-contractor undertaking specialist services. There is sometimes a perception that this is generating additional profit for the main contractor. This is not always the case. There is a distinction between the main contractor's margin and the need for a specialist to price specialised pieces of equipment, for example, which can only be priced at the market rate.

Overhead is different in specialist businesses and a subcontractor's margin will be greater as specialist businesses tend to be capital intensive and will need a higher rate of return than a main contractor that is generating substantial amounts of cash. An example is that a tunnelling package may be priced with a higher margin that a general civil engineering package.

There is the need to educate customers about these distinctions. Clearly if a contractor wishes to let work within its group, it has the potential to minimise areas of conflict and to provide a more integrated solution. In part, this explains why specialist units find that contracting with an external contractor tends to be more profitable. Interestingly, NEC4 envisages a single fee from both main contractor and subcontractor, instead of separate figures.

"Strong contractors retain certain risks rather than transferring all risk.

> The contractor needs to be given a level of reward that meets the level of value which that contractor brings.

With an open book environment, there is the need to recognise that different parties have different business models. There is a need to be transparent about margin. If not, the real margin is never established.

We consider either the wrong guidance was given in the Egan[15] report, or the Industry drew the wrong conclusions. Egan spoke of supply chain alignment. Those contractors who already integrated the supply chain continued to do so but those who had not done so previously, jumped on the bandwagon and paid lip service to it. From a client's perspective, the key issue is testing the extent of genuine alignment of risk in the supply chain.

There is a practical commercial issue about entrenching collaboration throughout the supply chain. Much of the supply chain does not have the central overhead and organisation to deal with collaborative issues. These logistical issues make it difficult for them to deal with collaboration culturally.

The size of many subcontractors either prevents them dealing and participating in gain and pain share or leads to a number not having the appetite to buy into gain and pain arrangements, a topic that is discussed further in the Supply Chain Involvement section below. That said, there needs to be the flexibility to accommodate those who wish to participate in risk share.

When tendering to the supply chain collaboratively, how much information should the contractor give? Should the contractor provide all of the information to the supply chain or be selective in providing relevant parts. The more specialist the trade, the more likely it is that substantial information should be provided, although this needs to be reviewed on a package by package basis.

- **What constitutes an incentive/ KPIs?**
  Can collaboration only occur where there is some element of incentivisation or can it work within a fixed price contract?

Whilst it isn't necessary to have a target cost with gain share/pain share, there does need to be an incentive. The incentive can either be within the contract or realised through the award of future projects to which the client has committed; the draft NEC alliance contract for example, can reward good financial and other key project performance metrics. If there isn't either of these incentive mechanisms, there is a sense that payment is being made to a contractor without any sanction.

The contractor needs to be given a level of reward which meets the level of value which that contractor brings. However, the biggest issue is that the prospect of gain share does not allow an honest declaration of the required profit levels. Contractors will take a view on the profitability of the project and reduce their profit on the basis they will make some money back through gain share. To an extent the contractors give away some element of gain to get the job in the first place during the tender process, thereby constraining the ability to share fully in the overall success of the project

In theory, if there is a lower but more predictable profit, those contractors who demonstrate superior performance will achieve the greater profit through gain by their better performance.

15 Rethinking Construction, (1998), (the 'Egan Report'), Department of the Environment, Transport and the Regions: London

> Clauses generally found in alliancing contracts, preventing claims for latent defects are enforceable.

Integrated Project Insurance (IPI)

The IPI contract model aligns all parties' interest under a single contract with its single integrated insurance policy. This is the first multi-party contract which does not require the parties to take out multiple insurance policies, thereby reducing insurance costs.

The insurance underwrites cost overruns beyond the excess which is aligned to the level of painshare (which is the capped amount of painshare the parties bear). The other features of the IPI policy are that it contains all-risk and latent defect insurance sections. By including a latent defect element within the policy, the need for parties to retain and price professional indemnity insurance is eliminated and enables the inclusion of no claims provisions where the parties undertake not to bring proceedings against each other.

There is a need to educate professionals and their insurers that the contractual clauses, generally found in alliancing contracts, preventing claims for latent defects are enforceable and in return for the benefit of latent defect insurance, all parties must accept the contractual standards for design and construction, whether they imply fitness for purpose of not.

The IPI insurance model means that the liability above the maximum painshare payable by the parties is insured and has the benefit of aligning all the key stakeholders and minimising or alleviating the prospect of losses for defective design. It should be noted that on traditional models, where there are claims for negligent design, damages paid out by professional indemnity insurers, are often outweighed by the costs to insurers for legal fees and expert witnesses.

One potential issue is that if designers are not taking the risk of being held liable for design defects, will they provide the best team in those circumstances? It is important that it is recognised that best for project behaviours should lead to strong teams being selected. The nature of the risk changes, so that liability for painshare from cost overrun must be seen as significant a key commercial driver, as the risk of being sued for negligent design.

Addressing risk in advance

Risk matrices which do not reflect the contract allocation of risk are to be discouraged. They can create conflict since parties concentrate on the risk matrix rather than the binding provisions of the contract. It is a common misconception that including an item on the risk register alters the allocation of who bears the risk.

Where a risk matrix is used, it must be aligned with the contractual risk allocation. NEC4 seeks to avoid such confusion by renaming the risk register as the early warning register.

Consideration should be given to prescribing in the contract, how risk will be allocated on key contingent or potential risks if they occur. Forms of contract which address this upfront are the MOD MTCC (Maximum Target Cost Contract) which sets out who has what risk and the Constructing Excellence forms of contract, which allocate cost and time risk for certain events in pre-agreed proportions in the event that they occur.

Frameworks

Frameworks do not necessarily promote collaboration. They are often perceived as a way of avoiding further OJEU procurement since there is then a mini competition on framework projects. Such frameworks are essentially zero value frameworks and there is no security of work.

Some of the water industry frameworks however have interesting structures which engender collaboration. KPIs relate to the overall management of the assets and not just the capital projects. There is an overall budget which has to be managed by both the water company and the contractors who are involved in strategic decisions as to whether new assets should be built or whether a refurbishment project of an existing asset is a better way of generating value.

There is also a total expenditure matrix which can be used by clients who have a number of assets over a longer period of time. Total expenditure includes new build costs, maintenance and improvements. This involves the contractors in looking into how the assets and the client's business works.

> Developers need to understand that if they produce buildings which meet fully customer's needs, they will create a significant competitive advantage for themselves.

For a framework to be effective, there are a number of key factors so that it is not simply an empty framework. It is important the framework obliges the parties to:

- obtain the benefit of learning on issues from early projects
- benefit from purchasing power and investment
- maintain a learning loop/ feedback, creating obligations in respect of education by making it a contractual obligation
- impose obligations in relation to creating efficiencies
- include meaningful incentives in the framework

With frameworks, there is the ability to mix the teams up. There is the advantage that brings new eyes and fresh ideas. This means that project teams are continually challenged. Again a cultural advisor could be employed with a role to determine what the framework requires and how best it can be delivered.

Development funding

Equity funds have no problem with innovation and adding value and are therefore prepared to consider structures which have the potential to drive value. However, debt funders look at things differently and are not interested in structures which do not give them cost certainty.

There needs to be a recognition that a fixed price contract placing all design and construction risks upon the contractor does not provide a certainty that it will achieve its aims. That said, irrespective of debt funders' reluctance to countenance structures other than fixed price contracts, developers need to understand that if they produce buildings which meet fully customer's needs, they will create a significant competitive advantage for themselves.

Those who hold assets for a long time ought to be able to move to a more collaborative model. There needs to be a greater understanding by developers that they produce buildings which meet customer's needs.

Where there is project funding of significant infrastructure projects, this has led to onerous terms being drafted. An example is the Thames Tideway project where the contract was set up with funders in mind.

We also consider that alliancing is difficult for traditional developers because of the need to have tenants etc. on board at the earliest stage. However, we do consider that forward funders could move to a more collaborative approach to projects, bearing in mind that they will be buying and holding the asset and generally will not be building speculatively.

Supply Chain Involvement

Spotlight

- There are four key links in a supply chain; People/Information/Cash/Project
- Clients should be at the heart of the drive for collaboration through the supply chain
- Prompt payment and greater certainty of profit are important catalysts for effective collaboration
- Early and effective engagement with the supply chain is critical for successful collaboration and for project success
- A layered approach to incentivisation and supplier engagement, depending upon the level of engagement, is necessary
- Understanding the 'Demand Chain' is vital

Overview

In the last 20 years, the introduction of the NEC form of contract (amongst others), the Latham[16] and Egan[17] reports as well as leading projects such as Heathrow T5 and the 2012 Olympics, have all influenced the Industry. It is against this background that we have considered collaboration in the supply chain, as well as the role played by the demand chain.

It is also important to recognise that with innovation and better technology, construction projects have become more complex processes, with more complex delivery requirements. The greater number of inter-dependencies and the use of technology such as BIM means that parties have to work together.

As a result, we have seen the introduction of new procurement models, including the growing use of alliancing and early contractor involvement, associated with mechanisms such as target cost contracts, all seeking to improve behaviours.

It is therefore necessary to look at how collaboration in the supply chain works in practice, focusing on items such as incentives, the role of the client and leadership and the ability of the supply chain to collaborate, for example by using ISO 44001 (Collaborative business relationship management systems). Outdated paradigms still persist, although our experience suggests that those joining the Industry more recently see nothing unusual in collaboration to deliver joint outputs.

In this regard, the commercial outcome still plays a significant, if not leading role. Greater certainty of a profit margin and confidence in payment are essential as a basis for trust and collaboration. The more confidence there is in the commercial basis of a deal or relationship, the more parties are encouraged to engage in collaborative behaviours.

In addition, it is important to appreciate that collaboration cannot be seen as a single approach that fits all circumstances. Some elements of the supply chain are much more suited to collaborative working than others but all parties can at least be part of more limited collaborative initiatives.

How the supply chain has changed

Over the past 20 years, the role of the supply chain has changed. The underlying financial model for main contractors has changed, with commercial pressure leading to a reduction in directly employed staff and a greater reliance on the supply chain. The role of specialist sub-contractors has therefore grown more important, for example allowing more of them to take the lead in providing advanced technological solutions; this has led to increasing inter-dependence between all elements of the supply chain and therefore more focus on collaboration. However, most UK contractors are not large enough to deliver without the benefit of a joint venture; whilst the primary catalyst for such a model is to reduce financial risk, it hinders the development of a cohesive project organisational culture as partners frequently change.

16 Latham, Sir M (1994), Constructing the Team, (the 'Latham Report'), HMSO
17 Rethinking Construction, (1998), (the 'Egan Report'), Department of the Environment, Transport and the Regions: London

A consequence of these developments, particularly the increased fragmentation in the delivery process, has been an increase in the cost of construction. There are many interfaces to be managed and all the tiers in the supply chain will have regard to their margins, overheads and the need to provide for contingencies.

Indeed, at one extreme this has led a to a procurement model where main contractors are providing services as a "project integrator"; clients feel they can contract directly with the supply chain and use the main contractor's skills in managing the project. This is quite different from the traditional role played by main contractors under fixed price contracts where the main contractor delivers the works through its own labour or sub-contractors.

The experience and skills of main contractors allows them to take a more pro-active role than in traditional construction management. Main contractors also recognise they may need to evolve and change how they deliver their services. To date, however, there is limited experience of the use of an 'integrator' model in practice, and it will be for clients to decide whether they feel confident enough to use it.

There have been cases where this approach has been undertaken, such as Anglian Water @one alliance[18]. In @one, the client contracted with clusters of suppliers incentivised to work together and also to share knowledge across the different alliances, using collaborative models aimed at addressing an alignment of outcomes between the parties. Clients however have largely maintained their traditional preference for appointing main contractors to provide a single point of responsibility, for example Transport for London.

There has also been a shift (possibly a drift) in understanding regarding the difference between suppliers/subcontractors within a supply chain and a more sophisticated approach to managing collaboration. Clients and main contractors have identified that there will be key suppliers, such as specialist subcontractors, who will be integral to delivery of the project, resulting in important inter-dependencies between all parties. This needs to be looked at in the wider context of the supply and demand chain, where a key sub-contractor may collaborate directly with a stakeholder as opposed to communicating through the main contractor and client.

Collaborative models should be encouraged with such parties, resulting in shared incentives and arrangements leading to long term relationships rather than focusing on cost only. This is supported by the introduction of ISO20400[19], which provides guidance to organisations of any size on integrating sustainability within procurement.

In contrast, it is necessary to recognise that collaboration is not a single approach with guidance to organisations, independent of their activity or size, on integrating sustainability within procurement, as described in ISO 26000 (Social Responsibility). It is intended for stakeholders involved in, or impacted by, procurement decisions and processes which can be applied uniformly to the supply chain.

Equally, there are suppliers who will play a less integral role and where the use of collaborative models will bring little, if any benefit, or indeed will give rise to further difficulties.

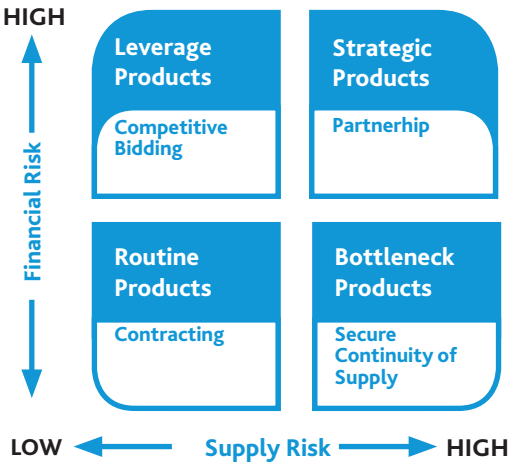
> It is necessary to recognise that collaboration is not a single approach.

18 http://onealliance.co.uk/
19 https://www.iso.org/standard/63026.html

> The client should not necessarily be seen as a simple single entity but a representative of the demand chain.

These are parties such as suppliers of plant for hire or material suppliers, or smaller sub-contractors, who provide a relatively simple function. Collaborative working habits can still be encouraged and clearly there is benefit to developing a long term working relationship, but such suppliers are less suitable for the use of collaborative models. This can be demonstrated in the diagram below[20]:

Figure 1: Collaborative Models



Collaboration in the supply (and demand) chain

Many suppliers state that they employ collaborative working practices within their organisation. However, in practice, there is uncertainty and inconsistency as regards what is meant by collaboration and how collaborative working is implemented within the supply chain. Moreover, supply chains are often dysfunctional[21] which adds to the difficulty in identifying what is meant by collaboration in the supply chain.

Supply chains need at least four links:

- People Link – delivery team needs to work as a team
- Information Link – clear communication
- Cash Link – security of payment
- Project Link – all delivery team members fully understand aims of the project

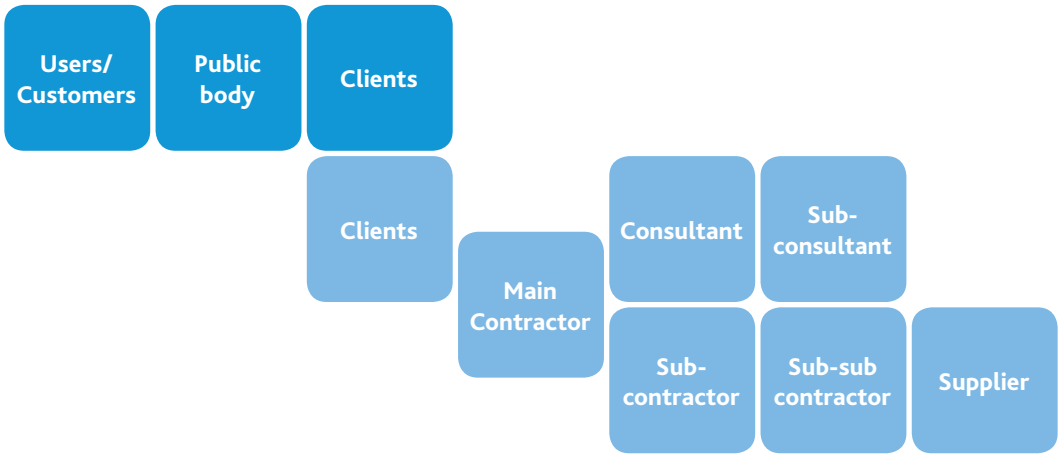
To that, it is necessary to add the role of the demand chain, which traditionally was seen as the client but in fact now often comprises other stakeholders with an interest (often a longer term interest) and an ability to influence.

The direct client will often be an entity which represents a public body or its shareholders. For large projects, there will be a large number of stakeholders, being the users (e.g. teachers in a school project) or other people affected by the works (e.g. the people affected by the proposed HS2 works, as well as the ultimate users). The demand chain requirements will be directly relevant to what the supply chain will ultimately deliver but it also means that collaboration becomes a more complex model; the client should not necessarily be seen as a simple single entity but a representative of the demand chain.

20 CIPS KNOWLEDGE, CIPS Procurement Topic, Kraljic Matrix (1983)
21 The Farmer Review of the UK Construction Labour Model - "Modernise or Die: Time to decide the industry's future", Mark Farmer, October 2016

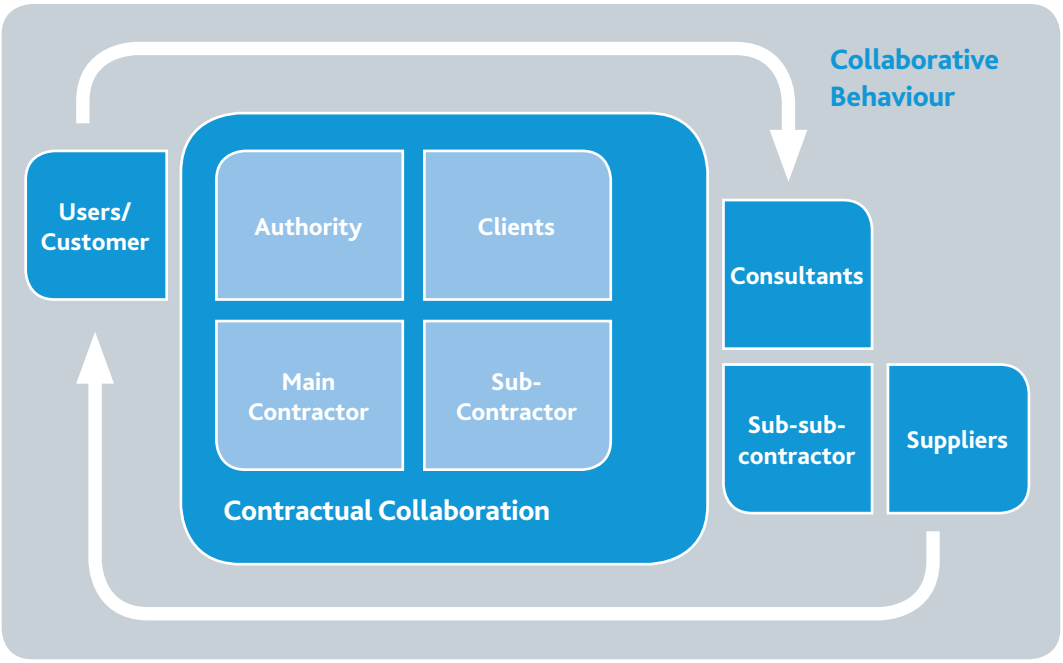
On the one hand, there will be a simple procurement model where the client is the joint link between the demand chain and supply chain:

Figure 2: Simple Procurement Model



On the other, there is a more collaborative model where, for example, stakeholders or end-users liaise directly with the supply chain, bypassing the chain. The actual collaborative model applies to the centre group with outside parties nonetheless exhibiting collaborative behaviours. But this is rarely achieved because the relevant members of the supply chain have not been appointed early enough to engage in meaningful dialogue. In addition, there is an, understandable, concern about bypassing contractual structures.

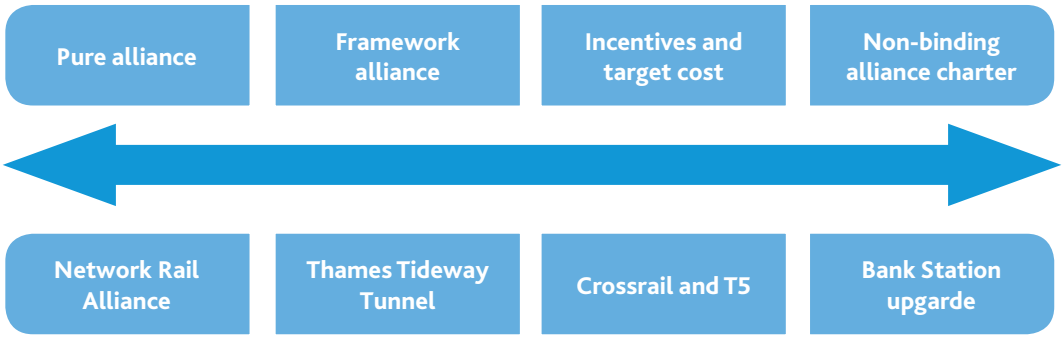
Figure 3: Collaborative Procurement Model



> Collaboration as a process is an input to a project and not an output or outcome in its own right.

Another way of looking at collaboration is to identify the range of possible models and examine specific models and where they appear within that range. The parties will look at various factors such as cost, risk allocation, level of required interaction between parties, formal / informal communication, fixity of scope and a share in outcomes in order to decide which route is best suitable for them.

Figure 4: Range of Collaborative Models



Collaboration, in particular incentivised contractual based collaboration, will not be suitable for all members in the supply chain; collaboration as a process is an input to a project and not an output or outcome in its own right.

The UK construction industry often uses the term "collaboration" as a one size fits all when in reality, a project may have a series of degrees of engagement. Depending on the project and the members of the supply chain, the level of engagement can range from a requirement that suppliers act in a reasonable and compliant way, to the need for the supply chain to be part of the project team. Failing to recognise that will result in the inappropriate use of collaborative models leading to an overall loss of confidence in the benefits of collaboration.

Rather than requiring all members of the supply chain to engage in a project team level of collaboration, more should be done in the Industry to encourage and improve collaborative working habits within the supply chain at a vertical level, using a layered approach to incentivisation and supplier engagement, based upon the strategic impact of a supplier and project need. The nature of the engagement with suppliers must be based not just on their contract value but on the strategic importance of their role to the success of the overall project.

In addition, horizontal collaboration in the supply chain is not currently being properly utilised. For example, on a project, numerous supply chain members may need to work independently at the same time at the same location. A challenge arises in coordinating these suppliers at the numerous inter-dependencies on the project, when the individual suppliers do not have a horizontal contractual relationship with other suppliers.

By way of example, the supplier who designs a cladding system cannot directly affect the design of the mechanical and electrical systems, even though they may be inter-related. This then becomes an issue of coordination and project management, rather than one of delivery through integrated collaboration. However, collaboration can play a key role in overcoming these issues.

Suppliers should be encouraged to adopt more collaborative working habits, for example, by requiring small suppliers to communicate with each other to manage the project interfaces without necessarily requiring these smaller suppliers to be part of a contractual collaborative strategic alliance.

It is however necessary to recognise there is a cost for carrying out such activities and a need to provide the necessary authority; suppliers should not be expected to do so without compensation and a framework in place.

It is also important to consider the role that the demand chain plays in the collaborative effort. Early collaboration with the supply chain could, or arguably should, involve engagement with other project stakeholders such as funders, Government agencies etc. to identify and overcome project constraints at an early stage. If the client is unwilling to be part of any collaborative steps, there will be much less of an opportunity to obtain the benefits of collaboration through the entire demand and supply chain.

The client is key

The client is key to driving collaboration through strong leadership. There needs to be a level of assurance from the client and the whole of the supply chain regarding what is expected of each party and what level of commitment is required. As noted below, greater certainty of profit is a key issue and that is something the client must recognise and seek to create, as a precondition to any collaborative working arrangements. Collaboration works best when there is trust which can be engendered by transparency as regards overheads, profit and cost. Other preconditions include clear common objectives, whilst workload pipeline certainty encourages suppliers to invest in these common outcomes.

The client also has the benefit of having a view of the project as a whole but must be willing to discuss this with its supply chain and recognise the role that it must play through coordination of the different parties. However traditional bilateral contracts are barriers to such dialogue. Tools such as RADAR and CAP (Resolex, RICS, 2017) aim to support the project leadership team in steering projects through potential conflict, improving project communication and coordination.

> More parties being involved means there are more people who can help identify risk and uncertainty.

The above requires client leadership and support to be successful, together with contractual project assessment and reporting processes that can operate in a constructive environment. This can be done by involving the supply chain early on in the project (at the design and/or planning stage or even earlier when the brief is being established) and by including collaboration champions and tools such as 180 and 360 reviews in the project.

All the more so when it is the tier 2 suppliers who are best placed to manage the risks. That means that the key supply chain members should not be characterised simply on the basis of size but more on their relevance and influence on the identified risks, actively involving them in risk management.

The risk workshops are also a useful way to develop relationships and trust. More parties being involved means there are more people who can help identify risk and uncertainty. In fact it can be argued that greater engagement by the supply chain in developing a project risk register is a condition precedent to meaningful collaboration.

Case Study: Network Rail, Costain and VVB

"We now have reached a significant milestone within the Signalling Power Migration. We have now successfully migrated around 50% of the works. This would not have happened without the ongoing support of the E&P team from Costain and their subcontractor VVB. The teams led by Daniel Owen Package Manager from Costain and James Wilson CRE Lead Tester VVB have assisted with their respective teams in delivering a significant volume of work successfully and safely. This has now put us in a very positive position going forward in completing these works."

Mark Fiedler – Network Rail, Scheme Project Manager– Telecoms & Signalling Power Line of Route

"The Cross Rail Anglia Project has various challenges for everyone. The Signalling Power Migration is just one of these. Challenges with design, installation, termination, testing and access. One by one the team has overcome each challenge. The signalling power migration is over multiple phases due to various time scales, even so, we are now almost half way through our programmed works with the collaboration between NR maintainer, and our installation teams and we are still overcoming different challenges which come up from time to time."

James Wilson – VVB - CRE Lead Tester Project Director of Crossrail East, Ben Wheeldon has thanked Crossrail Anglia for the work completed over the Easter weekend particularly at Shenfield. In a statement he said the Costain/Keltbray OLE teams successfully delivered the Shenfield OLE wiring over the Easter weekend, switching and section proving on programme and to a high standard of quality.

This, he explained was an extremely significant achievement – key to the commencement of Crossrail Stage 1 services from Shenfield to Liverpool Street from late May.

"Proactively learning lessons from Christmas, the enhanced inspection regime implemented by the team meant that the installation had had two independent inspections on top of the standard ITP and handback inspections before the planned section proving. The section proving was planned in detail with the active engagement of the ECR. I believe it is for these reasons that the section proving went extremely smoothly and was delivered well ahead of programme. Additionally, it was great to see the first major track stage at PML completed as well as numerous stations and LoR activities."

> Parties understandably want best value but also need to understand what they can afford.

Certainty is crucial to creating trust and collaboration and this helps to avoid information asymmetry where one party has better information to assess its position than another. A key issue is often who is leading on procurement and whether the approach is simply to seek the lowest price or adopt a more sophisticated approach seeking best overall value.

There needs therefore to be an up-skilling of procurement; costs are just one element but it is necessary to recognise how to assess value and the benefits of reducing risks. Parties understandably want best value but also need to understand what they can afford, together with an ability to understand risk and what value is; both are crucial. This will help to shift the focus from 'lowest price' to obtaining better value, rather than encourage contractors to 'buy work' or place all the risk with the supply chain, thereby failing to recognise that risk is better placed with the party best able to manage it and/or bear the consequences, which may well be the client (see also reference to Network Rail's minimum conditions of satisfaction above).

The Purchase and Supplier Engineering (PSE) model developed for Olympics 2012[23] highlights an approach through which demand and supply may be managed with benefits to supply chain achieved through greater package alignment. IUK has subsequently developed these concepts further within the Route Map.

Management of risk and uncertainty

Managing and allocating risk is fundamental to construction projects. A specific risk can be assigned a probability and be quantified while uncertainty in general is much more difficult to assess and manage[24].

Uncertainty, as well as risk, therefore affects the ability and willingness to collaborate throughout the supply chain. An approach where risk is 'dumped' on the main contractor who then seeks to pass it down the supply chain, will militate against most attempts at effective collaboration.

There needs to be a balance between risk and opportunity and both can be used to create an environment that promotes collaboration. This will however depend on the nature of the project, and where the scope is clear and fixed, it may well be the case that a traditional fixed price contract is better than alliancing for example.

To achieve this balance, the project team should be encouraged to engage with key suppliers early in the project development, with workshops being identified as a useful tool to engage with them and work their way through key issues, highlighting the true constraints and areas of uncertainty, thus facilitating better management of risk.

Using a scenario analysis approach, parties can consider in detail the different ways in which a project can develop, and look into particular anticipated risks and how they are best dealt with. This allows parties to draw out issues and to understand the true constraints, which in turn will lead to a better understanding of risk and opportunity. All projects should have a risk register that incorporates feedback from key suppliers and is agreed upon before construction begins.

Again, early collaboration with the principal supply chain members is key. Uncertainty will be at its highest level at the start of a project and the earlier all parties are involved the easier it is to reduce uncertainty. If project risks can be identified and apportioned appropriately in the early stages of the project development, the project team can take away or reduce uncertainty and therefore provide a stronger starting point for collaboration. This will also be an opportunity for specialist suppliers to demonstrate how they can use their expertise to solve problems at an early stage.

The use of project risk registers can aid the development of projects and build a close relationship both vertically and horizontally in the supply chain. They should be shared with the supply chain and consultants; different registers can be maintained if that is practical, as long as there is transparency for all parties.

23 Mead, J, Gruneberg, M (2013) Fig 1.1
24 For a discussion of risk and uncertainty, see Sanderson: Risk, uncertainty and governance in megaprojects: A critical discussion of alternative explanations International Journal of Project Management 30 (2012) 432-443

> If payment is not managed efficiently and fairly, attempts to encourage collaboration will not succeed.

Incentivising the supply chain

The use of target cost contracts with a pain/gain mechanism, often the NEC option C form of contract, appears to be the Industry's main tool for incentivisation. There seems to be less use of options such as bonuses for early completion or other incentives and while the pain/gain mechanism is suitable for main contracts, it is less easy to apply down the supply chain and can be undermined by the setting of a low target by insisting on lower prices.

Further, there is also a risk that complex reward mechanisms are used to compensate for a low price or mask the real underlying commercial transaction. Simplicity has its benefits and parties need to be wary of overly complex incentive schemes.

The main incentive is still to do with payment and greater certainty of profit. If payment is not managed efficiently and fairly, attempts to encourage collaboration will not succeed. There should therefore be a focus on steps such as the ones below, as a starting point for a collaborative environment:

- Payment of a fair price with greater certainty of profit. A key to the proper use of target cost contracts is setting up a target cost price that is realistic and based on actual cost rather than a competitive tender to reduce prices. In addition, using a pre-agreed percentage 'buffer' above and below the target may help to improve contractor confidence and allow the parties to focus on delivery as opposed to maintaining the commercial position.

- Having an agreed payment cycle. This is common place but payments periods are still an issue. This should become less of an issue as parties implement the Government's fair payment charter but the importance of regular cash flow cannot be underestimated.

- Project bank accounts play an important part in providing the supply chain with confidence in the commercial outcome. A client's use of project bank accounts will be regarded as a sign of confidence and trust in the supply chain, creating a better environment for collaboration.

- Where the main contractor has the potential to receive a bonus for its performance, that bonus should be shared with the supply chain who should have visibility of such arrangements.

There are other more general incentives that can be used as follows:

- Discretionary incentivisation, provided that criteria are clear, as incentives which are not clearly defined will not encourage collaboration. With delivery now relying extensively on tier 2 suppliers, the real competition should be on value and quality, which means greater use of KPIs enabling objective criteria for incentives to be set up at an early stage based on work elements that will represent genuine value.

- Opportunity for more work is important and the use of frameworks will support that. But it is important to ensure that the effort that goes into frameworks is subsequently rewarded with work, avoiding 'zombie' frameworks where no actual work packages are in fact procured. The client providing certainty of workload has been cited as a key driver of supply chain engagement and investment in the methods that enhance delivery performance, a key point that is reiterated in the Contractual Structures and Changing Risk profiles section above as regards the proactive structuring of frameworks to engender collaboration.

> A poor approach to defining the scope of a project inhibits collaboration and the supply chain needs greater certainty of what is required of it.

- Reputation is another important driver but it should be seen as secondary to other more important factors. Similarly, most supply chain members have an appetite for early engagement and are willing to do so, but it is necessary to recognise the cost of such involvement as well as issues surrounding who owns the intellectual property.

Overall, there is more work to be done in understanding what really drives better performance and the underlying commercial position of the supply chain, which can then be used to design incentives that are focused on genuine value and recognise the key driver of greater certainty of profit as the raison d'être of all commercial entities[25].

New Model Procurement Routes

The Government, with input from industry, is piloting new model procurement options with the underlying theme of early supply chain involvement and the use of alliancing models.

One of the options is Integrated Project Insurance (IPI). The IPI option requires a robust risk management process that engages the supply chain from the outset. The insurance policy is a financial loss policy which underwrites a cost plan agreed by the client and the team (see Government Construction Strategy 2016-20 published by the Infrastructure and Projects Authority).

The overall aim is to achieve savings of up to 20% of project costs through eliminating/reducing process waste but as noted above, the management of risk and uncertainty is key to collaboration. If risk and uncertainty can be reduced by enlightened client leadership interventions and complementary contractual structures, then the use of insurance, effectively spreading the cost of risk across the Industry, will allow better opportunities for collaboration

Challenges impeding collaboration

As noted above, certainty on risk is key to collaboration. A poor approach to defining the scope of a project inhibits collaboration and the supply chain needs greater clarity on what is required of it. In particular, where collaboration is sought, greater clarity on the purpose of the collaboration is required. This is also exacerbated by organisational culture, where there is no comprehensive effort to share knowledge and a lack of genuine commitment to collaboration.

Key barriers to effective supply chain collaboration include:

- Poor clienting or access to client-side advice at an early stage
- Poor scope definition
- Lack of focus upon outcomes or alignment of objectives
- Poor procurement or procurement that is disconnected from project management,
- Poor engagement and communications with the supply chain (see PSE model)
- Poor timing, in which by the time contractors have an opportunity to propose improvements, the scope of work has been fixed
- Poor supplier selection

Another relevant factor is that currently the UK has few barriers to entry in the construction industry. This means that there is no clear Industry standard in terms of capability or level of accreditation. This in turn can affect collaboration as suppliers may not have the necessary experience and/or resources to engage in a more collaborative approach to delivery of a project. For some suppliers, it will simply not be possible or alternatively they will see no benefit in investing time/money in working collaboratively with other suppliers and/or the main contractor/clients.

There is also a lack of skills and experience. All the more so as international contractors enter the UK market and, as noted above, form part of joint ventures with UK contractors. This provides an opportunity for using a whole range of possible collaboration models, but it must be based on greater understanding of what collaboration can mean and an upskilling of the ability to procure well and on value as opposed to just on price. Collaboration exists internationally and the publication of the International Standard for Collaborative Business Relationships (ISO44001) shows the appetite and need for a clear framework for collaboration.

25 Mead, J. Gruneberg, M. (2013) (Fig 3.5) describe the use of dashboards to measure key programme drivers. Where these drivers are based upon the strategic client requirements and linked into the procurement model KPIs that supply chain adopt to drive desired outcomes.

Case Study: Kier

BS 11000 was launched in 2010 and has since been taken up by a large number of clients and main contractors who have been implementing alliancing contracts and achieving certification. Bearing in mind the crucial role played by the supply chain, in 2015 Kier decided to put in place a scheme that allowed its tier 2 suppliers to learn about BS11000 and get certified in their own right. This would improve the suppliers' ability to tender for projects and help Kier demonstrate its own ability to deliver collaborative working. The Alliance Model was jointly developed by Kier and BSI and was piloted as a pan-industry first on Kier and its supply chain.

The scheme involved obtaining a commitment from 13 different supply chain partners to collaborative working by all signing up to a single set of objectives focused on customer outcomes. The partners were then directly involved in jointly developing a single collaborative management system for each of them to take and embed within their own organisations. This single system represented the 'one best way' for the partners to collaborate with one another and Kier as the lead organisation.

One of the unique facets of the model was the role of the lead organisation and what could be done by the lead on behalf of the smaller supplier partner without taking away the need for the supplier to fulfil all of the requirements of the standard – it was accepted by all parties up-front that there could be no 'BS 11000 lite' for the partners when obtaining their individual certifications. Each organisation was assessed separately in a two-stage audit conducted by BSI and all 13 partners certified to BS 11000 in March 2016.

Since implementation the scheme has been recognised across a wide landscape and has already won an ICW award in 2016 and an award from Highways England in 2017. Other industries are now looking to adopt the Alliance Model.

Case Study: Carillion

The award-winning Reading remodelling project has alleviated a major bottleneck on the busy Great Western network. As one of seven contractors that joined forces to undertake this major project, Carillion Senior Project Manager was quoted as saying "you do not have to work hard to achieve collaboration, but it can define success or failure".

The challenge to demonstrate benefits much earlier than programmed, prompted the key project stakeholders to adopt a 'one team' approach, illustrated by structured and on-going liaison, as well as the prompt and effective resolution of conflicts.

Although the various contractors were not contractually obliged to collaborate, nevertheless they quickly recognised that collaborating together for mutual success was the best way to achieve the exacting performance targets set.

In particular, the open discussion of problems and their joint resolution where the most appropriate party took the lead, was a major contributor to the success of the overall project. Other key initiatives included weekly construction coordination meetings, a weekly steering group as well as supplier and safety forums.

Contracting for collaboration

Whilst contractual provisions encouraging or requiring contractual collaboration may incentivise the supply chain, for real collaboration to be effective at a project team level, the project contracts need to be flexible enough to allow scope for collaboration and development.

In practice, that means that the supply chain needs to be involved at an early stage, before the scope is fixed and when it is possible to influence what is required. In addition, once the scope is fixed, the contract needs to allow an opportunity for further improvement. That has been recognised in NEC4, which is bringing in contractor's proposals to reduce the costs of the works as well as with regard to whole life savings, recognising the value of early investment to avoid a higher whole life cost. Another feature of NEC 4 is that option X12 will now be called collaboration rather than partnering.

In addition, the recently published ACA Framework Alliancing Contract is very much focused on supply chain collaboration. It provides mechanisms where competitive proposals can be revisited by alliance members and improvement is sought through new ways of engaging with the supply chain.

> There is a mixed picture of BIM use and BIM understanding throughout the construction industry.

BIM and its Impact on Procurement

Spotlight

- BIM must be made simpler to understand for all users and contributors (especially occasional clients and project teams)
- The Government should consider support for smaller organisations to reduce the risk of two-speed BIM
- More appropriate and focused training is required
- Quantifying and publicising the cost savings accruing from BIM will assist in its wider adoption
- Professional advisers need to improve the way in which they inform clients about BIM, manage expectations and explain the benefits in clear and simple terms
- Uniformity in documentation, software and technology and the proper use of standard protocols, led by clients, will also promote usage

Overview

In our first report, we highlighted the importance of Building Information Modelling (BIM) as a tool for driving greater collaboration in the construction industry. If used as intended, BIM (particularly Level 2 and Level 3 BIM) has the potential to help drive collaboration throughout the construction industry and deliver benefits for all parties. However, there is a mixed picture of BIM use and BIM understanding throughout the construction industry (in both public and private sector led domains).

The UK Government has attempted to lead the way in using BIM on its projects. Collaborative working practices and, since April 2016, BIM Level 2 data delivery is now mandated for work on central Government-funded projects. However, there is a significant gap between what has been mandated for use by central Government and what is happening in practice. 59% of respondents to the NBS's most recent BIM survey of designers in the construction industry agreed with the statement that the Government requires collaborative 3D BIM on its projects.[26] Disappointingly, this left 41% either disagreeing or undecided as to whether Government now requires collaborative 3D BIM. A slim majority (51% of respondents) thought that the Government is on the right track with BIM, but a similar number considers that Government is also failing to enforce the BIM mandate.

Across the private sector, our feedback is that the use of BIM appears to be patchy at best. The private sector has not yet adopted BIM use to anywhere near the same extent as central Government-funded projects. Significant elements of the private sector are still reluctant to require BIM for use on projects, either through lack of understanding of what BIM is and the benefits it can bring or through a belief that BIM adds greater cost than value.

Our view on the importance of BIM and its current market use is also supported by other recent analysis of the UK's construction industry. For example, the Farmer Review observed that:

"Despite Building Information Modelling (BIM) being a critical change agent for the industry completely intertwined with the move to manufacturing led approaches discussed above, there appears to also be a large scale reality gap related to the industry's BIM adoption strategy. The government's own measures to lead this agenda as a client of the industry have not reached significant parts of the design and construction world, which unfortunately includes the majority of housebuilders and private developers. Investment in and adoption of BIM is being stymied, with some notable exceptions, by all of the issues highlighted already around lack of willingness to invest, collaborate and the inability to see the bigger picture business case. 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." [27]

26 NBS National BIM Report 2017
27 The Farmer Review of the UK Construction Labour Model - "Modernise or Die: Time to decide the industry's future", Mark Farmer, October 2016, page 36

> BIM certainly has the capability to engender more collaborative working, and collaborative working will lead to more effective use of BIM.

This quote from the Farmer Review also highlights the potential development of a "two-speed" approach to BIM in the UK's construction industry. Larger, more sophisticated players who have the resources (time, money and willingness) to invest in BIM and upskill their workforce, are reaping the benefit of this investment through repeated work on BIM-mandated projects (whether private or public sector). However, there is still a feeling that SMEs are, to a greater or lesser extent, lagging behind the larger enterprises. They do not have sufficient resources to invest in BIM and are not getting exposure to enough BIM-mandated projects to justify their initial investment in BIM. Short term pressures are therefore outweighing potential longer terms gains.

Our observations detail the key themes emerging from the discussions of our BIM Working Group. These focus on the current use of BIM in the UK's construction industry, an analysis of some of the issues highlighted by current BIM use, and our thoughts on how use of BIM could be improved with the goal of driving greater collaboration within the UK's construction industry. Our observations are also supported by more empirical analysis carried out by the NBS and reported in their most recent National BIM Report 2017. Where relevant, we have highlighted these findings in this section.

What is also clear from Industry feedback is that using BIM does not automatically guarantee that a project will proceed on a collaborative basis. However, BIM certainly has the capability to engender more collaborative working, and collaborative working will lead to more effective use of BIM. We see BIM as a means to an end, not an end in itself. It is a tool to help create a faster, more efficient, more cost effective and more collaborative design and construction process.

Behaviour is the key to collaboration, as highlighted in other parts of this report; none of that changes because of BIM or any other technology.

The benefits of BIM are becoming clear

In the early years of BIM use, identifying the benefits of BIM was harder than it is now. Data was not as readily available to demonstrate cost savings achievable through using BIM and other benefits were less quantifiable. Now, with the construction industry more aware of BIM and used to working with it[28], the benefits become more obvious as time goes on. We consider that these can be summarised as follows:

- Benefits of BIM for clients: (i) Reduced capital expenditure and operational expenditure, (ii) Faster design and construction process, (iii) Increased understanding of the design and construction process (e.g. easier visualisation than interpreting 2D drawings), (iv) Improved risk management, (v) Increased quality and value, (vi) Potential for "greener" projects through enhanced environmental analysis, (vii) A "treasure trove" of data available relating to the design, construction and operation of the built asset, (viii) Greater cost transparency

- Benefits of BIM for the professional team (designers, cost consultants etc.): (i) Improved co-ordination, (ii) Improved visualisation, (iii) Improved cost estimating, (iv) Improved clash detection, (v) Faster and more accurate design, (vi) Improved absorption/ management of change (although possibly no material reduction in the amount of change)

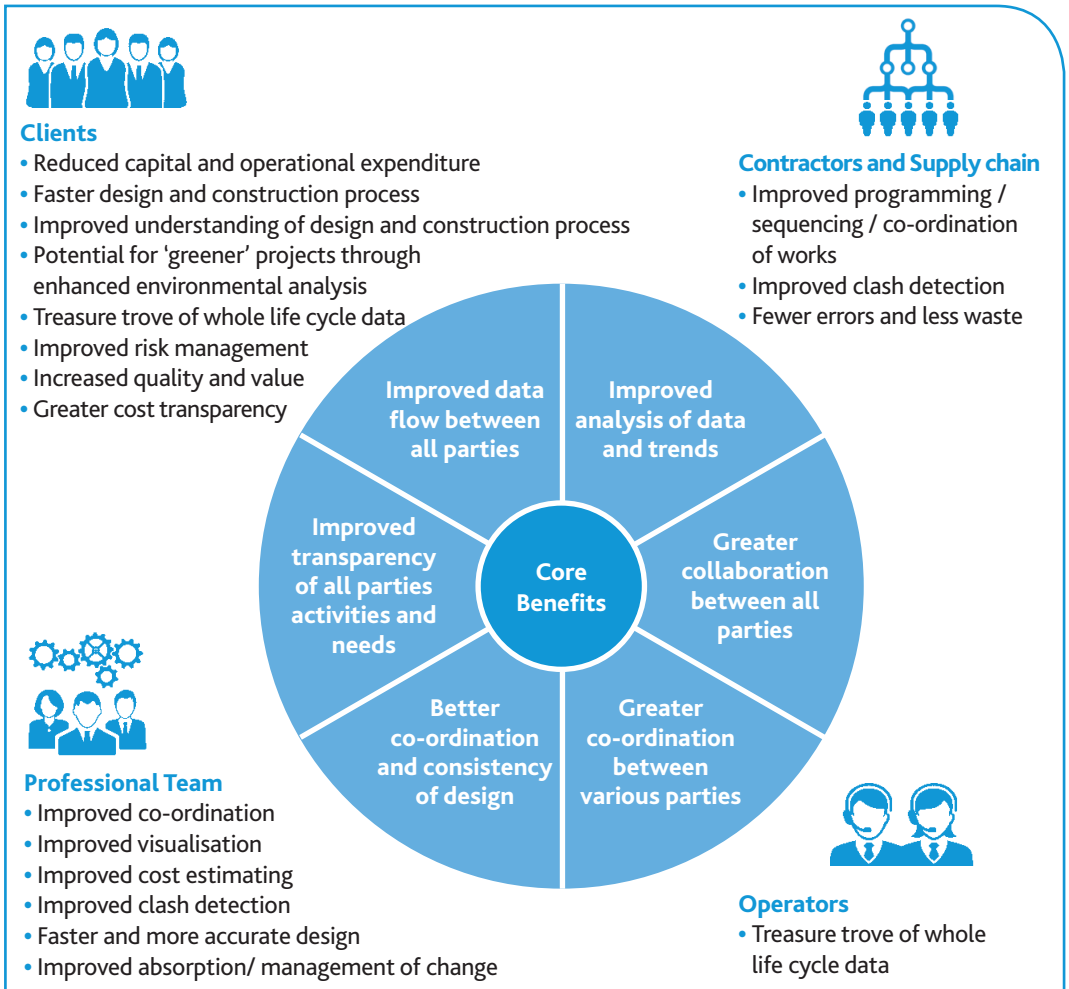
- Benefits of BIM for Contractors and the construction supply chain: (i) Improved programming / sequencing / co-ordination of the works, (ii) improved clash detection, (iii) Fewer errors and less waste, creating potential for reduced abortive work,

- Benefits of BIM for operators (e.g. facilities managers, tenants/occupiers): (i) A "treasure trove" of data available relating to the design, construction and operation of the built asset

- Overarching benefits of BIM for all parties: (i) Greater collaboration between all parties, (ii) Greater co-ordination between various parties (e.g. the clients, design consultants, main contractor and specialist sub-contractors) (iii) Greater co-ordination and consistency of designs, (iv) Improved visibility of what other parties are doing and enhanced understanding of other parties' needs, (v) Improved data flow between all parties, (vi) Improved analysis of data and trends

28 The NBS's National BIM Report 2017 reports 97% of respondents being aware of BIM and 62% of respondents now using BIM on some of their projects (up from just 13% in 2011).

Figure 5: Benefits of BIM



We consider that the benefits of BIM are clear, but it is making these known and easily understandable that is key to its wider adoption in the Industry. Despite the benefits, Level 2 BIM has not yet been achieved across the industry and is probably still some way off[29] and clients, particularly those in the private sector, seem reluctant to specify the use of BIM on their projects.

We asked a series of key questions: "if the benefits of BIM are so obvious, why are clients reluctant to specify the use of BIM on their projects?" Do they not understand the benefits of BIM? Has Government and the 'BIM industry' not made the benefits of BIM sufficiently clear and understandable? Are clients not getting helpful advice from their professional team? Is BIM (its language, jargon and documents) just too complex and far removed from traditional design and construction to be easily understood by clients (who may have little or no prior experience of construction)? Do clients have to employ additional team members (e.g. a BIM Information Manager) in order to use BIM? Do clients believe that BIM adds greater cost than value? Do clients not trust what they hear about BIM and lack the confidence to require that BIM is used on their projects?

29 Indeed, the NBS's National BIM Report 2017 reports 37% of respondents still not being clear what they have to do to comply with the Government's 2016 Level 2 BIM mandate.

Our experience and feedback from the Industry tell us that it is a combination of some or all of these factors that too often leads clients (particularly those in the private sector) to shy away from specifying BIM for use on their projects.[30]

The Government, the 'BIM industry', design consultants and the project management/quantity surveying community need to become far better at explaining the benefits of BIM to clients in clear and simple terms and, where possible, using quantifiable evidence. Government has sought to take a lead on this by outlining cost savings that BIM has brought to central Government projects. However, this evidence is still based on a relatively small number of projects. It is also hard to find demonstrable evidence of cost savings brought about by BIM on non-Governmental projects. A central database that is accessible to all and that can capture this type of evidence may help to convince reluctant clients (and their advisors) that BIM really would be of benefit to them.

The importance of the client in driving BIM use

Allied to the importance of making the benefits of BIM clear and understandable to all parties (particularly the clients), we consider that it is the client who is key to driving greater BIM use (and consequent collaboration) in the construction industry. It is the clients who will decide whether to specify the use of BIM in its professional team appointments and construction contracts. Without this impetus, there will be no incentive to use BIM on a project.

However, it is noted that even though a client may not specify BIM for use on a particular project, this does not necessarily prevent that client's design team from using BIM technology to carry out their designs. Designers seem to have a greater feel for the benefits of BIM than clients and so may still choose to use BIM technology in any event, although that client will not reap the more comprehensive benefits of BIM (not least not being provided with a BIM model by its design and contracting team).

For clients to specify BIM use on their projects, they and their professional advisors (e.g. the Project Manager/QS and the design team leader) need to understand what BIM is and what it can do (see above). Clear guidance is required for clients and the professional advisors on how to move from traditional methods of design/construction to BIM Level 2. We consider that it is still currently not clear enough what aspects of BIM Level 2 translate to traditional methods of design/construction.

We also consider that there is an onus on the client's professional advisers to manage the client's expectations about what BIM is, what it can do and the information it will produce. Clients need to appreciate the different potential outputs of BIM so that the client's Information Requirements are aligned with its wants and needs.

Furthermore, we see a need for more 'intelligent' and involved clients. A client who needs/ wants a 'smart' building will also need to be heavily involved in the design process in order to define what's required. Everyone has to buy-in at the beginning of the process.

30 This is also supported by the NBS's National BIM Report 2017 which reports 72% of respondents agreeing with the following statement: "Clients don't understand the benefits of BIM"

There are significant gaps in the types of project and sector that BIM is used in

We see significant gaps in the types of project and disciplines that use BIM most frequently. Architects, structural engineers and building services engineers appear to be the design disciplines that have more readily adopted BIM and to greatest effect. BIM is well suited, for example, to new-build projects with numerous mechanical & electrical services. In contrast, feedback suggests that complex refurbishment projects in existing buildings (particularly historic buildings) do not lend themselves well to BIM. The BIM technology has not yet caught up with and adapted for use with these types of projects.

BIM also appears ideally suited to those clients who will own and operate the built asset. For example, a shopping centre developer that commissions, owns and operates a shopping centre will obtain the widest range of benefits available to a client in using BIM (as highlighted above) and will also obtain a wealth of data (e.g. cost, technical, operational and maintenance information) about the built asset that will help operate and manage the shopping centre more efficiently and cost effectively over its lifetime (see the Westfield case study below).

As well as differences in the types of project that BIM is used on, there are differences in the sectoral take-up of BIM. Some sectors have adopted BIM widely. Given the Government's mandate for use, the sectors most commonly using BIM are considered to be public sector projects such as health, education and social housing. However, BIM is not restricted to the public sector. We see evidence of BIM use in private offices and private leisure developments, as well as other private sector projects. However, other sectors (e.g. civil engineering / infrastructure and landscaping) seem slow to adopt BIM, even though there are obvious benefits for long term owners and operators of assets (e.g. utilities companies, rail and road owner/operators).

We also see little evidence of BIM use by the large private sector housing developers. Perhaps this is because they have no long term ownership of the built assets and so see little need to adopt BIM when they have no need to use all the information that BIM would provide. But if BIM could be shown to produce definite cost and time savings in design and constructing a development this may well help to change perceptions. As an alternative, developers in the private rental sector may come to adopt BIM due to the benefits BIM brings to long term owners of assets, for example in managing on-going asset maintenance programmes and associated costs.

An area that seems ripe for BIM use is the facilities management sector. However, at the moment, this sector seems least persuaded by the benefits of BIM and has little desire to understand and work with BIM. In our experience, facilities managers are having great difficulty getting to grips with BIM. For example, there is uncertainty regarding what to do with a BIM model once the building has been constructed; there is a distinct lack of knowledge regarding how to update the BIM model when alterations are made to a building several years after its construction.

We believe that facilities managers could derive many benefits from BIM (not least access to comprehensive and useful data that would assist in the operation and maintenance of their buildings), but this does not seem to be valued by the facilities management industry at present. Allied to this, it is also difficult to produce BIM for the operational stage of a development as clients often have not defined their facilities management requirements at the start of the project. Clients would obtain more benefit at the operational stage of a development if they spent time considering their facilities management requirements at the beginning of the project.[31]

Smaller organisations are struggling to become BIM-enabled

The construction industry has not yet achieved widespread use of Level 2 BIM, despite the Government's mandate for it to be used on public sector projects. Smaller designers, main contractors and specialist sub-contractors are still not yet BIM-enabled, with the potential result of missing out on certain types of work and not benefitting from the advantages of BIM usage (see above).

31 Our views are also supported by the NBS's National BIM Report 2017 which reports just 26% of respondents saying that, on projects they have been involved with over the last 12 months, they have passed on the BIM model to those who are responsible for the continued management of the building.

Our views are also supported by the NBS's National BIM Report 2017 which reports less than half (48%) of small practices (15 or fewer staff) having adopted BIM. The percentages of adoption for medium practices (16 - 50 staff) and large practices (50+ staff) are both 74%. Whilst encouraging, this shows that the majority of small practices and a significant minority of medium and large practices in the UK are still not yet BIM-enabled. The NBS's National BIM Report 2017 does not review BIM adoption in the construction supply chain (main contractors and specialist sub-contractors etc.), but our experience nevertheless suggests that a significant minority of them are also not yet fully BIM-enabled.

The key question is: "what is preventing organisations from becoming BIM-enabled?" Lack of client demand may be one of the reasons, as may be a lack of time to get up to speed with BIM. The costs of implementing BIM will be another of the factors that are off-putting for some. These costs (in both time and money) include:

- Investment in upgraded hardware;
- Software licensing[32];
- Potential salary premiums of employing personnel trained in BIM software;
- The training of existing personnel;
- Setting up standard BIM libraries; and
- The scale of record keeping required – memory, storage facilities and processes that have to cover all models.

Unless using BIM frequently, becoming BIM-enabled can seem like a large outlay of time and money for little use. There may not be enough BIM-mandated projects to spread the cost over. It is a daunting subject to get to grips with for those who do not have abundant resources (money, personnel, time, willingness) to devote to understanding what BIM is, purchasing technology, upskilling the workforce and/or hiring BIM-trained staff.

The danger is that BIM-enabled organisations will forge ahead, reaping the benefits of being BIM-enabled. Those organisations that are not BIM-enabled may survive by working on projects where BIM is either not required or not appropriate, but that approach may not be sustainable in the longer term and such types of project may become increasingly rare.

The importance of technology

What is becoming increasingly apparent is the importance of technology in using BIM. This is not just confined to the hardware and software that is needed to work with BIM. There is so much technology that measures and monitors each parties' progress, which in turn is driving greater transparency as regards what all the key project parties are doing; everyone is aware of what actions everyone else has and the progress against each action. Other people's problems become more obvious, leading to greater understanding of everyone else's position. People seem more willing to change decisions to provide benefits for all. BIM technology is driving greater transparency which is in turn driving greater collaboration.

As discussed above, BIM technology also has the potential to produce a huge amount of data. Knowing how to interpret and use that data will be very important in the near future, driving automation for the good of all principal project stakeholders. We envisage that data analysts are going to be key in the future.

32 Some commentators have seen individual software subscriptions costing upwards of £4,000 each per year

> Cloud technology will soon be key to design.

The amount of data that BIM generates will also require BIM-enabled organisations to maintain robust data storage facilities and cloud technology in order to keep a record of each iteration of a BIM model and other data produced by each team member. Cloud technology will soon be key to design. But this could lead to breaches of confidentiality obligations. Questions that will soon need to be answered are:

- Will the use of cloud technology be acceptable when working on projects that require the highest level of data security?
  Where are the servers located?
- How secure are the servers and what is the back-up plan if the servers fail?

A further technology issue to be considered is how to validate the data that is produced from using BIM and how to ensure that the BIM model works effectively. Most clients are probably not even aware of this issue and equally do not have the money to spend checking the data and model(s) that they receive. It is a significant task that can be costly and time consuming.

However, data validation is one of the key differences between BIM and utilising enhanced 3D design. BIM provides data as well as drawings, a key difference between designing with CAD drawings and with BIM. But it is crucial to know how, and to have the resources, to check the data that has been generated. Having a BIM Co-ordinator/BIM Information Manager can help clients with data validation, but this is also potentially off-putting as a perceived further expense. It would also mean employing someone to carry out a role that clients may know little about; they may not feel empowered to ask intelligent/informed questions and to challenge the data validation process.

Existing BIM documents are confusing and there is no universally adopted approach

We have already highlighted the need for a simple and clear explanation of the benefits of BIM that can be used to entice reluctant clients to adopt BIM on their projects. We also consider that the Industry needs a simple and clear set of BIM standards and documents that make BIM and its implementation easier to understand.

At present, it is considered that key standards (e.g. BS 1192:2007 and PAS 1192-2:2013) are simply too large and complex, particularly for inexperienced clients and other parties. In particular, the diagrams in these standards are complex and not easy to comprehend.

We also consider that the current BIM standards and publications do not demonstrate sufficiently well how BIM fits into existing construction documents. Furthermore, we believe that certain sectors (e.g. civil engineering / infrastructure) are not well served through the PAS documents and other BIM related info. The documents just do not seem to relate to these sectors. This may explain why certain infrastructure organisations, e.g. Highways England, are developing their own BIM documents to make things easier.

In addition, there appears to be no common adoption of standards and publications across the Industry. BIM is a collaborative process and standards aim to describe the processes, structures and definitions that allow collaboration. If collaboration is to be a success, then each party needs to comply with agreed standards.

However, whilst BIM is being adopted in the Industry, there is no one standard that is being used by a majority. The NBS's National BIM Report 2017 highlights that BS 1192:2007 + A2:2016 (which describes the collaborative production of architectural, engineering and construction information) is most commonly used (although by 39% of respondents). BS 1192-2:2013 is used by 38% of respondents. Other standards and publications (e.g. BS 1192-3:2014, the RIBA Plan of Work 2013, Uniclass 2015 and the CIC BIM Protocol) are all used by less than one third of respondents.

Our sense is that there is still a long way to go in order to bring about wider use of BIM standards and publications. Additional BIM standards are also in development but, before forging ahead with further standards[33] and publications, maybe now is the time to pause, consolidate and simplify what is already in existence.

33 (PAS 1192-6 ("Specification for collaborative sharing and use of structured hazard and risk information for Health & Safety") and PAS 1192-7 ("Specification for defining and sharing structured digital construction product information")

> Different software packages may not 'talk' to each other, leading to potential errors or loss of integrity when data is exchanged amongst different systems.

Incompatibility and interoperability of software continues to be a concern

There is still considerable variety in the types of software tools organisations use in the BIM process. Products produced by Autodesk, Graphisoft and Nemetscheck (to name a few) have each received significant use within the Industry but no one software tool has achieved market dominance. This leaves open the possibility of parties on a particular project using different software with consequent incompatibility and interoperability issues that may arise.

Different software packages may not 'talk' to each other, leading to potential errors or loss of integrity when data is exchanged amongst different systems. Despite claims from manufacturers, too often software doesn't work with other software. The technology is not yet as compatible as the technology manufacturers claim it is. Frequent software updates and new software also causes disruption. There is also the important need to ensure that data (e.g. IFC files) is capable of use by the end-user and is not going to be lost or rendered unusable during any data transfer.

Therefore, we see a need for uniformity of software and technology. The lack of a standard approach to software is causing issues and there is a clear need for harmonisation of IT systems. Single platforms are essential, as ably demonstrated by the VHS v Betamax debate.

The Industry also needs to address the question of which party should be responsible for incompatibility/interoperability issues. For example, under clause 5 of the current CIC BIM Protocol[34], the Project Team Member does not warrant the integrity of any electronic data delivered in accordance with the Protocol. In addition, the Project Team Member has no liability to the client in connection with any corruption or any unintended amendment, modification or alteration of the electronic data in a Specified Model which occurs after it has been transmitted by the Project Team Member, save where such corruption, amendment, modification or alteration is a result of the Project Team Member's failure to comply with the Protocol.

This type of clause effectively passes the risk of incompatibility/interoperability issues to clients, which is often difficult for them to accept. They have engaged the design team and main contractor to design and construct the project and are reliant on their skills and technology to deliver that project. The clients may also have little or no experience of construction and BIM technology. This type of clause looks to be passing to clients a risk that they are least equipped to bear. An alternative approach may be to make the producer of the data responsible for any incompatibility/interoperability issues.[35]

Another potential solution is to specify an agreed set of compatible software or to specify agreed checking procedures to deal with any known incompatibility/interoperability issues that may exist in the software that the design and construction team propose to use. Of course, this does not completely remove the risk but it may help to reduce it.

Using BIM with (novated) design & build procurement

Feedback from Industry suggests that there are difficulties in aligning interests and obligations relating to BIM when using a novated design & build procurement route. For example, prior to novation an architect will be working for the client and working to its client's Information Requirements. Once novated, the main contractor will also seek to ensure that the architect is working to the contractor's BIM Execution Plan. This may impose different or additional requirements to those included in the client's Information Requirements. This confusion of obligations can create inefficiency and duplicated or otherwise unnecessary work.

There are also concerns regarding how to pass responsibility for the BIM model. The design team typically contributes significant thought and creativity into the design process. But there are concerns that this may be wasted upon novation as another party (the main contractor) assumes responsibility for the design of the project. The design is essentially done again mid-way through the design/construction process.

34 First edition, 2013. We understand that a second edition may be due for publication sometime in 2017.
35 The CIOB Complex Projects Contract makes the contractor responsible for the suitability and integrity of the software selected, where it prepared the specifications.

Accordingly, we consider that Level 2 BIM needs to better integrate with private sector procurement routes (e.g. two stage design & build) in addition to public sector procurement.

Working with a BIM protocol

One of the most effective ways of including obligations relating to BIM is to use a separate protocol that consolidates all the BIM requirements in one place. This document can then be included in the relevant professional team appointments and main contract. The CIC has produced a BIM Protocol[36] that seeks to detail all the BIM requirements. However, this has not yet been universally adopted[37] and other organisations (including some clients) are developing their own bespoke BIM protocols.

Those using BIM protocols need to be aware of their potential limitations and should ensure that potential issues are addressed in the drafting before difficulties arise in practice[38]. For example, the parties should seek greater clarity on what the "Permitted Purpose" of a BIM model is. Designers and the construction supply chain need to know what the BIM model is actually going to be used for. Accurately and clearly defining the Level of Detail is crucial.

We also see confusion regarding use of the Model Production and Delivery Table. A specimen of such a table is included in the CIC's BIM Protocol. This is intended as a guide as to what to include in the actual Model Production and Delivery Table for a particular project but parties have been using it literally (without adapting it to their particular needs) to their detriment.

36 First edition, 2013. We understand that a second edition may be due for publication sometime in 2017.
37 The NBS's National BIM Report 2017 reports just 25% of respondents saying that their organisation uses the CIC BIM Protocol.
38 For examples of these limitations and issues, see "Building Information Modelling: The Legal Frontier – Overcoming Legal and Contractual Obstacles", written by May Winfield and published by the Society of Construction Law, April 2015

Case Study: Allies and Morrison

In looking to add a state of the art research facility to their estates portfolio, the client recognised the value of BIM in the management of multiple assets from the outset of the project. Prior to the initiation of the design process, the client looked to assess internal organisational structures required to adopt BIM through and appointed a BIM Manager. Despite this foresight on the client's part, the subsequent Employer's Information Requirements (EIR) produced lacked sufficient asset specific references and the generic format of the document would produce many challenges over the design and construction stages.

In a slightly unusual step, the iterative development of the design through BIM software and processes was carried out on a research basis and no BIM specific references were inserted in appointment documents or fee structures. Whilst the UK Government BIM Level 2 mandate was not specified on the project, the standard was adopted as a minimum requirement across BIM processes. BIM deliverables on the project included design authoring of 2D information from the models, clash detection, COBie data population and Uniclass classification embedment into BIM objects. Definition of the client's asset information requirements were compiled by the BIM Manager through a number of workshops with the buildings end-users; however the incoherence of the resultant assist list resulted in minimal usable data being produced by all disciplines through the design stages.

The informal nature of the BIM implementation strategy was challenged by the design team as the successful contractor appointment process was formalised through the novation agreements. The CIC Protocol was adopted as the BIM agreement of choice, however not before a number of crucial amendments were made by both parties. These changes ranged from improvements to descriptions within the Definitions, to fundamental changes to the hierarchal relationship between 2D information and the 3D model in the case of discrepancies. There were also further clarifications inserted to protect the practice from uses of the architectural model outside of the 'Permitted Purposes'.

The introduction of the main contractor into the delivery process immediately drew attention to a number of deficiencies within the EIR. The task of unpicking the client's actual requirements for asset specific data was a lengthy and complex process. This was complicated further by the limited BIM capabilities of a number of the sub-contractors. In a change to the usual responsibility structure, our practice submitted an additional scope of work, for BIM Management, which compensated for the gaps within the supply chain, but with the agreement that we would not be responsible for sub-contractor data integrated within the architectural model.

The importance of BIM on this particular project will not fully materialise until the Asset Information Model has been implemented in the new facility. There are however, a number of early indications on-site to suggest that the use of BIM in the design coordination process has a true value and this is currently acting as a catalyst, in the integration of BIM from the design workflow, into the construction environment.

Case Study: Westfield

As a retail developer, Westfield have always moved with the times and responded to change by embracing new technologies and creating their own, playing an instrumental role in the changing face of retail. With this knowledge and experience Westfield are able to create their own centres to suit their exact needs, aligning smart design and technological innovation to enhancing the consumer experience.

In the UK, Westfield first adopted BIM tools and processes in 2009 and has since committed to implementing BIM on all projects from RIBA stage 2. Our approach to BIM goes beyond 3D modelling with obligations placed upon all project stakeholders for BIM to be fully embedded within the design as a managed, collaborative process. Where available, models are used in all coordination and decision making exercises in design, planning and construction. The outputs from BIM are used by all stakeholders both external and internal across all of Westfield's functional departments including development, leasing, marketing and centre management.

Being the developer, contractor and operator of our centres, Westfield are able to reap the benefits of the information accumulated throughout the building lifecycle and use it to inform intelligent decision making. The data is managed and verified against our information requirements using a bespoke validation engine ensuring the accuracy and reliability of all data extracted from the BIM models. As an example, with well structured, verified data, we're able to use quantities derived from the design models and track them within trade contractor models, monitoring costs and more accurately quantifying the cost of change. As most clients, we use the models in visualisation and virtual reality allowing our leadership team and investors the chance to experience parts of the projects when making key decisions. The use of virtual mock-ups and digital site tours helps create informed decisions giving surety of delivery and a reduction in rework.

All members of the design and construction team are offered training and support in using BIM processes and technologies to enhance their own role whether it be design, commercial or construction management. Some people such as planners and design managers spend as much, if not more time within the 3D models than they would looking at 2D drawings. The models are even taken on site as you would a 2D drawing in monitoring progress and installation. It wouldn't be unusual to walk onto a Westfield site seeing people with tablets and even a drone flying overhead capturing images and point cloud data.

As the Building Information Models mature and develop from design through to construction they are finally delivered to our centre management team as an Asset Information Model (AIM) allowing rapid access to information saving time in facilities management and improving health and safety.

We have considered the most prominent issues regarding the current use of BIM in the UK's construction industry. We believe that BIM is already helping to drive greater collaboration throughout the construction industry and deliver benefits for all parties. However, the construction industry is really only just getting off the starting grid in its use and understanding of BIM. As more and more parties become familiar with BIM and its benefits, this in turn should generate a virtuous circle of BIM adoption and greater collaboration in the Industry. However, there are various initiatives that we feel can be implemented in order to speed up this journey and make it smoother.

Clearer explanations of the benefits of BIM (particularly for clients)

As already discussed, Government and the 'BIM industry' needs to be far better at explaining to the construction industry as a whole what the benefits of BIM are. This needs to be done in a clear, simple and understandable way. This message also needs a particular focus on the benefits of BIM to clients, since it is clients who really have the power and influence to drive greater BIM use within the Industry. Clients should be given the tools to make an informed decision about whether or not to use BIM on their projects.

Clearer explanations of the cost savings that BIM can bring

In addition to the general need to get better at explaining the benefits of BIM, we consider that there needs to be a particular focus on highlighting the cost savings that can be obtained by the use of BIM. It is this information that will be the real catalyst for more clients deciding to use BIM on their projects. The cost-savings analysis produced by Government is helpful, but this relates to Government projects typically procured under Government procurement routes. In addition, much of the cost saving information seems to be aspirational "could lead to 33% cost reduction ..." for example.

In order to be more meaningful and gain the attention of a wider audience, some way is needed of showing real cost savings from non central Government projects and private sector projects. For example, can the Industry establish a database that is freely accessible to all, that captures accurate cost information about BIM and non-BIM projects to help provide a comparison? Clear, hard evidence is required to provide further impetus for the more widespread use of BIM.

Making BIM use a contractual obligation

In order to enable greater use of BIM, we consider that using BIM needs to be driven by the clients and included as a contractual obligation in the construction contracts and professional team appointments. This will also obligate all relevant parties to use BIM as required by the clients, rather than as they would like to use BIM. However, in order to work effectively, this also requires the clients to include clear BIM obligations (including a well written set of Client's Information Requirements) in the relevant contracts.

> Like any effective tool, the trick with BIM is in knowing how and when best to use it.

A need for simplified and standardised BIM documentation in plain language

As already highlighted in this Report, we consider that the Industry needs a simple and clear set of BIM standards and documents that make BIM and its implementation easier to understand. For example, a well written, clear, simple standardised template Client's Information Requirements and a BIM Execution Plan that could be used for all BIM projects would be of great benefit to the Industry.

Industry standards (e.g. the PAS documents) should be reviewed to make sure that they are as effective, clear and understandable as possible. The Industry should strive to produce standards and documents that are used on a common basis throughout the Industry, rather than the current situation where many different types of documents are being used.

There is also a need for standardisation of specifications, instead of the current practice of individual architectural practices writing their own specifications. This will drive efficiency and lower costs.

A need for uniformity of software and technology

We consider that those working with BIM would be well served by the emergence of a single, popular BIM software that becomes widely adopted throughout the Industry. There is a need for uniformity of software and technology and a harmonisation of IT systems. Interoperability is a key issue and single platforms are essential.

Financial assistance for organisations wanting to become BIM-enabled In order to avoid the possibility of a "two-speed" industry (the "BIM Haves" and "BIM Have Nots") we consider that financial assistance is required for those organisations who wish to become BIM enabled but who have not been able to do so (whether because of lack of money, time, willingness, demand etc.). Financial assistance (whether through grant funding, tax incentives or otherwise) would enable organisations to procure the relevant software and other technology and train their employees to requisite standards. This would help to level the playing field and create a baseline level of BIM competence and skills amongst the construction industry bringing benefits to all (the design and construction communities and the end-users of the built asset).

A need for more widespread training/education on BIM

We consider that there is a clear need for greater education for everyone involved with the construction industry regarding BIM. At present, there appear to be a lot of misconceptions and a distinct lack of understanding about BIM (e.g. a common statement is: "what's the difference between CAD designing and BIM?"). For example, lawyers need to understand BIM in order to write building contracts and consultant appointments that properly incorporate clear and well drafted BIM provisions. As already mentioned, clients need to understand BIM in order to appreciate its benefits and to know how to specify their BIM requirements in contracts and appointments. Designers need to understand the vast quantity of data that is produced through using BIM, how to interpret that data and how that data is best used and project managers/quantity surveyors need to understand BIM in order to assist in advising clients on whether to use BIM on a particular project.

Being disciplined in the use of BIM

Like any effective tool, the trick with BIM is in knowing how and when best to use it. Feedback from Industry suggests that parties should not get into BIM too early; it is often not needed for the early stages of projects (e.g. planning) and can sometimes drive collaboration too early, as is the case with clash detection. A strong design team is needed to deal with this.

BIM creates a large amount of information and data, but granular detail too early can cause a lot of confusion. There is also a need to think carefully about the outputs from using BIM as some aspects of BIM may not be suitable for all clients, for example the extensive data being produced from BIM may be too burdensome for many clients. Workflows also need to be managed properly, as there is potential for significant misinterpretation to occur. The design programme is now produced on a fundamentally different basis than in the past and managing this is a real challenge.

> The consolidated efforts of our Key Theme working groups present an ardent and cogent argument for fundamental change.

The importance of early contractor involvement and connecting the design team to the construction supply chain

We consider that early contractor involvement is key to the successful use of BIM. Involving the main contractor and lead designer from an early stage (e.g. Stage 2 or 3) is key, allowing designers to have early access to the main contractor and specialists in order to allow greater information sharing/co-ordination.

Making good use of BIM really needs early contractor engagement, which will in turn lead to greater collaboration. On a typical design & build project where the main contractor comes in after Stages 2 and 3, it is to some extent at the mercy of what has already been designed by others. The main contractor may need to employ someone to make sense of what has been designed and to comprehend the BIM Model(s) that have been produced by others. This is inherently very wasteful and inefficient and could be greatly improved by earlier contractor engagement and integration within the design team.

Taking this a stage further, a procurement route that truly connects the design team to the specialist sub-contractors would also help to generate far greater collaboration and efficiency. No current procurement route currently enables this. As the recent Farmer Review states: "Industry-wide adoption of digitisation through media such as BIM … is predicated on collaboration. The BIM model sits at the heart of any project and only functions fully if traditional design and construction barriers are broken down by multi-party liaison and working" .

Early engagement between the main contractor/ key specialists and the design team is therefore key to successful use of BIM and greater collaborative working.

4.0 Making a *Real* Difference

Generally

"If you always do what you've always done, you'll always get what you've always got."
So said Henry Ford.

One of the principal aims of this Report is to prompt the Industry to look at itself through a different lens and to consider collaboration as one significant contributor towards enhancing robust performance improvement.

The consolidated efforts of our Key Theme working groups present an ardent and cogent argument for fundamental change. We are not pretending such change will be easy, nor free of controversy.

However, we believe that the following principal suggestions and recommendations present a 'route map' for deliverable and sustainable change in the pursuit of collaborative performance improvement.

After all, as Einstein is reputed to have said "doing the same thing over and over again and expecting different results is the true definition of insanity".

Effective Team Working

The absence of trust is one of the key factors in dysfunctional team working and is exacerbated by the Industry's leading paradigm, namely, when something goes wrong, the prevailing thought is 'whose fault is this; who can we blame?', rather than focusing on collaborative problem solving.

However, as Brené Brown so eloquently puts it, those that blame a lot "seldom have the grit and determination to actually hold people accountable". Why?; because they spend too much of their time venting anger and frustration and in doing so, perpetuate the endemic blame culture that pervades the Industry.

In order for teams to be truly effective, we believe that clients and project sponsors must demonstrate a more comprehensive appreciation of the dynamics of teams, especially those relating to blame and accountability. The ultimate client needs to set the environment within which the project team collaborates effectively and ensure that all team members exhibit the correct behaviours.

The desire amongst many project teams to shift risk rather than to manage or share that risk, tends to result in a duel between the client's representatives and the members of the delivery team focused on securing ultimate protection for the client and preparing grounds for the ability to apportion blame in the future. The immediate focus is not on finding a practical and equitable solution.

Inevitably, it is the clients that can be the catalyst for change here. We are not advocating the abdication of responsibility, nor the abandonment of accountability; quite the opposite in fact. We simply argue that the way forward is to maintain accountability without blame and allow open discussion of issues and vulnerabilities but importantly, whilst suspending judgement.

In addition, we are also convinced that the proactive use of team coaching, as well as expanding the role of the Partnering Advisor or Alliance Manager for example, will enable many teams to benefit from an independent and constructively challenging input. In doing so however, clients can again lead the way by helping to dispel the myth that the need for coaching is a sign of weakness.

Given the importance of the performance of individuals as well as teams, we support the more incisive appointment of key personnel on the basis of focused interviews and psychometric profiling, especially during the project or programme mobilisation phase.

A skilled coach can act as "the conscience of the team" and help it to account for its collective performance, provided that the coach does not become the 'de facto' leader of the team. The ultimate client needs to set the environment within which the project team collaborates effectively and ensures that all team members exhibit the correct behaviours.

It is those forward thinking clients who are more inclined to become the disruptors and innovators of the Industry.

It is imperative however, that the Industry recognises that effective team working is not the exclusive preserve of the major clients and tier 1 contractors. The majority of work on site is delivered through SMEs, where behaviours are generally driven from site. How those on site behave and operatives' responses to those behaviours is key to effective team working.

Industry Leadership

The Construction Leadership Council (CLC) has the best potential to become the platform from which an integrated leadership voice can evolve. We advocate appointing representative members to the CLC from key umbrella bodies and/or professional bodies in exchange for contributions to funding, in order to give the CLC greater reach and influence in order to better enable it to promote and espouse collaboration.

Professional bodies need to look closely at the changing roles of their members and better equip them for those roles, through enhanced training and development programmes.

It is evident that finance professionals, in particular, need to understand more about the Industry and the varying procurement, design and construction processes, including valuing the true cost of an asset over its whole lifecycle. They need to better appreciate the benefits of those approaches to funding and risk management which embrace collaborative techniques and attempt to remove risk through collaboration, rather than passing risk down through the supply chain.

We believe that the wider project finance industry should better understand the benefits of collaborative/risk sharing approaches to procurement and develop new approaches to measuring financial success of projects.

Considerable inertia remains within the traditional professionals supporting and advising the Industry. Accordingly, we argue that they will need to fundamentally redefine their roles and be more willing to embrace new technology and collaborative working techniques, for example through enhanced training and development programmes.

Confucius is reputed to have said "tell me and I will forget; show me and I may remember; involve me and I will understand". By adopting this philosophy, educators can help future professionals to better comprehend the interfaces between the various professional disciplines, why the Industry operates in the way that it does and hence how it might collaborate to better effect in the future.

The future influencers in our Industry, must be encouraged to challenge and to look at the ways in which their generation can embrace change and collaborative working for the better.

It is those forward thinking clients who are more inclined to become the disruptors and innovators of the Industry and therefore likely to stimulate and inspire change in the Industry, certainly in the short to medium term. Progressive and innovative procurers anxious to capitalise on the benefits of new technologies and more collaborative approaches are more likely to demand that the Industry responds to their aspirations and expectations.

We predict that innovators and disruptors will also emerge in the form of larger global consulting groups and international contracting groups offering turnkey packages to clients.

In addition to its promotion of new models of construction procurement, the Government has a critical role to play as an 'economic and behavioural enabler', perhaps utilising major public sector infrastructure programmes as exemplars of best practice collaborative working. Whilst some notable progress has been made, we consider that Government can and should do more as regards taking a leadership role in improving the use of collaborative working. In addition, post-Brexit, the Government may be able to streamline public-sector procurement processes, if the EU Procurement Regulations no longer apply.

In order to bring about sustainable change, we recommend that the Industry establishes protocols and centres of excellence for the collation and dissemination of compelling evidence regarding the impact of technology, smart technology and collaborative techniques on the quality of design and construction, together with user experience of associated improvements in operational efficiency and cost. Such feedback from end users will ultimately be the key to changing long term behaviours. As we commented earlier in this Report, the more

of the 'big beast' organisations that are convinced of the desirability of changing their approach and practices, the sooner the Industry will recognise that change is both necessary and inevitable.

Contractual Structures and Changing Risk Profiles

We believe that the facilitation of project strategy should be undertaken pre tender, by a third party professional and should include a fundamental understanding of rates of return as well as capital targets. Pivotal to this is the fact that the interests of all parties must be aligned and focus on what the wider project needs to succeed, if truly collaborative behaviours are to be more widely adopted.

Our experience also suggests that construction contracts should ideally include procedures for incisive team selection and also provide on-going training to support collaborative working. Early contractor involvement is essential for this process to work effectively.

Additionally, we recommend that post completion teams should be integrated into the contractual planning process such that the benefits of collaborating working can best be harnessed, thus minimising the separation of design and construction.

The accurate and timely provision of reliable cost data is vital to the successful initiation and delivery of construction projects. Far too often however, budgets are set using forecast cost information which does not reflect actual expenditure, the inadequacy of this situation being exacerbated in times of adverse inflationary pressures.

Despite the concerted efforts of the Royal Institution of Chartered Surveyors' Building Cost Information Service (BCIS), as well as leading cost management firms such the former Davis Langdon and EC Harris for example, the Industry remains lamentably poor at sharing tactical cost data on the out-turn (as opposed to early forecast) costs of completed projects. At its most basic, this situation often results in the team which is prepared to take the most risk being successful, rather than the one best suited to carrying out the project.

Accordingly, we advocate a fundamental shift in attitude and practice, whereby the Industry recognises that accurate and readily available historical project cost data is an absolute prerequisite to enhanced performance though collaborative working.

We believe that there is a strong case for the payment of bidders to ensure that their best efforts are directed towards submitting robust, deliverable and affordable tenders. In return, clients should be entitled to utilise the proposals of losing bidders, if they are found to create value for the project.

In addition, through the more widespread use of complementary contractual provisions and the team working relationships summarised above, the Industry should discourage the established practice whereby main contractors generally flow all main contract terms into the provisions of sub-contracts, adding their own domestic, additional risks, all to the detriment of the remainder of the supply chain members and arguably, also to the client.

That said, we recognise that much of the supply chain does not have the overhead and organisational infrastructure to adequately deal with collaborative issues, making it more difficult for them to embrace collaboration from a cultural and operational perspective. However, based upon the principles outlined in this Report, we envisage a gradual progression towards a situation whereby supply chain members have the opportunity to 'invest for success' in this regard, especially if engaged early in the project initiation process.

Without equitable sharing of risk, it is difficult to collaborate fully. Accordingly, we advocate that the Industry reviews its approach to risk, as well as more conventional contractual provisions, in order that risk is apportioned to those parties best able to manage it and/or bear the consequences. Where a risk matrix is used, our view is that it must be aligned with the contractual risk allocation and that consideration must be given to prescribing in the contract how risk will be allocated on key contingent or potential risks if they occur.

> Different software packages may not 'talk' to each other, leading to potential errors or loss of integrity when data is exchanged amongst different systems.

The increased usage of simple yet effective incentivisation mechanisms, importantly not solely based upon financial criteria, are another opportunity to make a real difference in the Industry and encourage effective collaboration. It is instructive that the recently published draft NEC Alliancing Contract is not solely driven by financial key performance indicators. However, one significant impediment is that the prospect of gain share does not allow an honest declaration of the required profit levels, causing contractors to take a view on the profitability of the project and reduce their profit on the assumption that they will make some money back through gain share. A wider set of KPIs and contractor selection on a best for project basis, may lead to an increase in the declaration of these profit levels.

In our first report we said "for collaborative construction to become more prevalent, the Industry needs to change its attitude to what constitutes success and value from a project". In particular when developing tender selection criteria, we believe that the emphasis ought to be on what constitutes value for the project rather than just price.

Supply Chain Involvement

The results of our further research and consultation, reinforce our view that collaborative models should be encouraged throughout the supply chain, resulting in shared incentives and arrangements leading to long term relationships, rather than those focusing only on lowest cost.

However, in order for the Industry to make a step change in supply chain collaboration, we consider that it must address four fundamental links, namely People, Information, Cash and Project. Project delivery teams, including all supply chain members, must understand and implement the fundamentals of effective team working, whilst clearly communicating key information and ensuring that it is fully understood by all relevant parties. Security of cash flow is imperative, whilst all delivery team members must fully understand the underlying aims and objectives of all members, not just those of clients.

Clients can suffer from inertia as regards their relationships with supply chain members. There is an inherent distrust of contractors and suppliers, clients often, for example, being reluctant to declare their budgets in advance.

This leads to a 'standoff' during the tender period where all parties are uncertain whether the project in question will ever be affordable, primarily based upon clients' fear that the tier 1 contractors in particular will make excessive profits by 'over-bidding', even in a competitive tendering environment. The reality of course is very different, with the Industry operating on very low margins but frequently without the ability or inclination to demonstrate financial performance, even with the use of 'open-book' style contracts.

Contrast that situation with high-volume manufacturing for example, where some clients are known to insist that their supply chain partners must demonstrate auditable profitability as a key tenet of their working relationships.

The incentivisation of the supply chain and consultants is often frowned upon, if for no other reason than there is a belief that, for example, excellent performance is what's expected in any event. Where they are used, the details for incentives are rarely spelled out well.

In recent years, several new procurement models such as the NEC standard form contracts, most notably NEC4, together with the ACA suite of alliancing contracts, have been introduced. We support the early engagement with supply chain organisations as advocated in these and similar contracts and urge the Industry to more widely adopt the associated collaborative behaviours.

In addition to requiring all members of the supply chain to engage in a project team level of collaboration, we challenge the Industry to also encourage and improve collaborative working within the supply chain in a vertical dimension, using a layered approach to incentivisation and supplier engagement, based upon the strategic impact and importance of supplier and project need.

Preparing this Report has further convinced us that the Industry needs to better recognise the contribution of the supply chain throughout 'critical path' project or programme activities. Importantly, the nature of the engagement with suppliers, at all levels, must be based not just on their contract value but also on the strategic importance of their role to the overall success of the project.

Last but not least, we believe that there is more work to be done in understanding what really drives better performance and the underlying commercial position of the supply chain, which can then be used to design incentives that are focused on genuine value and also recognise the key driver of greater certainty of profit, as the raison d'être of all commercial entities and relationships.

BIM and its Impact on Procurement

Clients have a pivotal role to play in the use of BIM and we urge them to utilise their influence to improve awareness and its usage. However, even where clients may not specify the use of BIM, we believe that this should not necessarily prevent that client's design team from using BIM technology to carry out their designs. Although clients may not immediately appreciate the benefits, the adoption of BIM will nevertheless enable them to better manage their properties and reduce the whole life costs of their built assets.

Professional Advisors need to improve the way in which they inform clients and manage their expectations about BIM, in terms of what it can do, how it translates to traditional methods of procurement and the information and records it will produce. Clients need to appreciate the different outputs which are possible so that the EIRs can be better aligned with the client's wants and needs and also which party is responsible for incompatibility/ interoperability issues

Whilst the principles of BIM are well suited to many different types of project, there continue to be significant gaps in the both the types of project and sector that BIM is used in. Accordingly, the Industry would be better served, if its adoption and associated benefits became more widespread.

We acknowledge that, for a variety of reasons, smaller organisations are struggling to become BIM-enabled, most notably because the relative absence of suitable BIM-enabled projects, does not enable them to adequately invest in sufficient resources and training. Accordingly, in order for all strata within the supply chain to best embrace BIM, increased support will be required to facilitate that, especially from central Government in relation to public-sector projects.

We believe that the Government should consider financial support for smaller organisations wishing to become BIM enabled, via a regime of grant funding and tax incentives etc. This would reduce the risk of a 'two-speed' industry. Additionally, clearer guidance is required for clients on the benefits of BIM and on what it can contribute to their projects, including cost savings.

Fundamental to the increased usage of BIM is clients' need to recognise that they will need to be more involved in a BIM enabled project from the outset, especially in the design process and in defining what is required.

BIM should be driven by clients and included as a Contractual obligation in professional terms of appointment and construction contracts with clear BIM obligations and requirements, reflecting the importance of early contractor involvement and connecting the design team to the construction supply chain.

If the Industry, including clients, wishes to take full advantage of BIM, then it must develop sufficient protocols to manage, store and retrieve the requisite data, as well as invest in the associated hardware and software technology. A fundamental precursor however, will be greater progress towards the standardisation of BIM-related information and communications technology.

When generic BIM protocols are used, such as that published by the CIC, we strongly recommend that the parties take care to complete all relevant details, for example defining the level of detail and recognise that such protocols do not necessarily deal with all the relevant issues which need to be addressed. The use of simplified and standardised BIM documentation, written in plain language, will enhance adoption and further encourage collaborative working.

Although we welcome the use of BIM protocols, to date their use has been sporadic, notwithstanding the notable efforts of the CIC in producing its bespoke document. Moreover, a number of clients have produced their own protocols, which has led to inconsistencies in formant and content.

Accordingly, we support the consolidation of all BIM requirements into a single document, which could then be incorporated within the relevant professional team appointments, as well as main contract and associated supplier/sub-contractor agreements.

When using a novated design & build procurement route, there are inherent difficulties in aligning interests and obligations relating to BIM, which can create inefficiencies and duplication, for example in those instances where the design is essentially re-worked part -way through the design/ construction process. In these circumstances, we consider that Level 2 BIM must better integrate with the more prevalent private sector procurement routes such as two stage design & build.

We also consider that more practical training and education for the Industry in relation to BIM, will help to resolve misconceptions and encourage a greater understanding of its benefits and risks, as will uniformity of supporting software and technology.

5.0 Conclusion

"The bitter disappointment of poor quality lingers long after the sweet delight of a cheap price has been forgotten". This quote, often attributed to John Ruskin, sums up many of issues that we have identified in this Report.

Our further research and consultation has only served to reaffirm our belief that a structured approach to collaborative working is essential if the Industry is to prosper and achieve the performance improvements that it so desperately seeks.

We believe that the proposals and recommendations developed by our working groups would, if adopted, contribute significantly towards the more widespread and effective adoption of collaborative working, as well as encourage the Industry to take a longer term view on issues such as measures of project success and value.

In conclusion, we say the Industry must start to contract for collaborative success, not blame-driven failure.

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