School of the Built Environment
Construction Management &
Engineering

University of Reading

DELIVERING MORE FOR LESS UNDER THE IPI MODEL

Trialling IPI on a live construction project: learning from Advance II at Dudley College

FINAL RESEARCH REPORT

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Contents

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Acronyms

BEP	BIM Execution Plan
BIM	Building Information Modelling
CAR	Contractors All Risks
CDE	Common Data Environment
COBie	Construction Operations Building Information Exchange
EIR	Employer Information Requirements
EoI	Expression of Interest
FIRA	Financial Independent Risk Assurer
IF	Independent Facilitator
IPI	Integrated Project Insurance
IPT	Integrated Project Team
ITT	Invitation to Tender
KPI	Key Performance Indicator
LDI	Latent Defects Insurance
LEP	Local Enterprise Partnership
NEC	New Engineering Contract
OJEU	Official Journal of the European Union
PEP	Project Execution Plan
PI	Professional Indemnity
PQQ	Pre-Qualification Questionnaire
R&D	Research and Development
SIPs	Structural Insulated Panels
SOI	Systems Operational Interface
TABS	Thermally Active Building System
TIRA	Technical Independent Risk Assurer
UoR	University of Reading

Figures and Tables

EXECUTIVE SUMMARY

This report presents the results of an Action Research project, funded by InnovateUK under Grant Nr 101345 that supported and examined the application of Integrated Project Insurance (IPI) on a live construction project (Advance II) for Dudley College in the UK West Midlands between 2014 and 2017.

The IPI Model is a new form of insurance-backed alliancing, incorporating single project insurance, and used for the first time on the Advance II project for Dudley College. This trial application of IPI – undertaken as part of the UK Cabinet Office 'Trial Projects' initiative designed to test innovative procurement practices in UK construction – has provided a robust test of the workability and value of the IPI Model. Advance II, under IPI, has broken new ground in project procurement, organisation and delivery and demonstrated considerable benefit from collaborative working among the key project participants. The project has achieved many notable successes, and has generated valuable learning for future applications of IPI, as well as for collaborative project working more generally. A number of challenges have also arisen on the project and, overall, achievements should be viewed in the context of a project that was aiming to meet a demanding set of quality, cost and programme targets while at the same time pioneering completely new governance methods, organisational structures and operational processes.

Under the IPI Model, Dudley College has obtained a completed facility that, at the time of finalising this report (January to February 2018) it considers to be high quality; to meet most of its key success criteria; and, indeed – through a range of technical and process innovations – to exceed many of them. Further, the project was delivered within the client's overall Investment Target and ready for occupation for the start of the 2017/18 academic year. While the Target Outturn Cost was exceeded by a small margin (c.1.8%), the client's share of the excess – via a Gain/Pain Share arrangement under IPI in which all members of the project Alliance share in risk and reward – was some 0.34% of the Target Cost. Similarly, while the project was delivered four weeks after the revised completion date (on an overall construction programme of some 66 weeks), extensive testing and system 'proving' prior to handover meant that the facility was ready for use on occupation.

A notable feature of the project has been the highly effective collaboration between designers and constructors, working in an Alliance with the client, and focused on achieving clearly stated strategic goals and success criteria. The IPI Model, with its comprehensive arrangements for procurement and governance throughout the project – ranging from formal procurement, contract and insurance provisions, through less formal (though very active) facilitation to encourage and

support collaborative working – has been instrumental in establishing and enabling a working environment in which this effective collaboration has flourished. Central to the IPI Model has been the sharing of risk and reward by Alliance Members, engendering a sense of ownership of project outcomes and a sharing of responsibility for achieving them. Additionally, the IPI Policy with its unique insurance for cost overrun above an agreed 'excess' helped ensure that risks borne by the members of the project Alliance were manageable and shared, and provided a strong measure of cost certainty that supported the collaborative search for innovation.

Of course, the collaborative strength of the Alliance has been tested by important developments on Advance II, notably during detailed design and construction when it emerged that the Target Outturn Cost might be exceeded and, later, when the agreed completion date came under threat. It is a testament to the robustness of the IPI Model that both the Alliance Contract and IPI Policy remained unchallenged through this process; and also that the collaborative commitment among the Alliance – supported throughout by Independent Facilitation – prevailed and helped to identify solutions founded on the collective approach to risk and reward sharing.

This testing environment for IPI – and the continuous search for improvement and learning that was central to the Action Research approach adopted on the InnovateUK-funded research project supporting the trial of IPI on Advance II – has helped identify many improvements for the IPI Model. These mainly affect the governance and management arrangements concerned with the detailed operation of IPI. And while there are suggested improvements also for the more formal mechanisms of IPI, the relevant changes required to the public procurement arrangements, the Alliance Contract and the IPI Policy are all relatively minor and do not alter their substantive content. In so far as this trial of IPI on Advance II is concerned (albeit limited to one project), the fundamental aspects of the IPI Model have been shown to be robust, workable and highly effective.

Perhaps the most significant measure of the success of the trial on IPI on Advance II is that, despite the challenges encountered – and the fact that Alliance Members have borne a share of the relatively small cost overrun – all the participants recorded the project as a very positive experience in collaborative working and one they would be keen to undertake again. The sharing of risk and reward by the Alliance, and the provision of opportunity for Members to work collaboratively towards project goals, while a significant departure from arrangements typically encountered in UK construction, are what participants found most valuable in the IPI Model.

PART 1: INTRODUCTION

Introduction and the IPI concept

This report presents the results of an Action Research project that supported and examined the application of a new approach to project procurement and delivery (called Integrated Project Insurance) on a live construction project (Advance II) for Dudley College in the UK West Midlands between 2014 and 2017.

Integrated Project Insurance (IPI) is described more fully in Part 2 of this report, but is essentially a form of project procurement and delivery designed to promote effective collaborative working among design and construction team members. It is based on an 'alliancing' approach within which an integrated design and construction team work together in an alliance with the client, supported by a range of mechanisms including a new form of insurance (sometimes referred to as Single Project Insurance) for all key project risks on a project-wide basis. This insurance covers the alliance as a 'virtual company' under a single policy for all normally-insured project risks including construction all risks, public/third party liability and liability for latent defects. This is a departure from normal UK practice which typically provides cover via separate policies for individual design and construction team members in relation to their respective liabilities. In addition, and in a further departure from normal UK practice, the policy provides cover for cost overrun in addition to cover for delay in project completion. By covering the liabilities of the alliance as a single entity in this way, the policy provides an important underpinning to other aspects of the IPI Model which, by focusing on encouraging more collaborative endeavour among alliance members, aims to improve project outcomes compared to more conventional procurement approaches. The Advance II project is the first application of this approach in UK construction.

Background and context

Origins of the IPI Model

The IPI Model was created by the founders of a construction consultancy – Integrated Project Initiatives Ltd (known as IPInitiatives), established in 2011 to continue the commercial development of IPI – together with Insurance Brokers Griffiths & Armour, and with support from industry bodies, including the Specialist Engineering Alliance[1]. The approach grew out of the direct experience of its creators of team working and project performance on a succession of construction projects, combined with their reflections on how interdisciplinary collaboration could

[1]Integrated Project Initiatives (2014) *The Integrated Project Insurance (IPI) Model: Project Procurement and Delivery Guidance*, 2 July 2014, Integrated Project Iinitiatives Ltd.

be improved to deliver more effective project outcomes. Their particular innovation was to combine what they believed to be workable elements of an effective collaborative approach with a new form of single project insurance that would support design and construction teams in working better together. While the origins of these different elements may be traced to earlier work on partnering, alliancing, integrated project teams and other approaches (see, for example, Bresnen, 2009; Xue 2010; and, for a more practice-based overview, Roberts, 2016 ; HM Treasury, 2014)[2], the creators themselves identify key projects as being particularly influential. These are[3]:

- Building Down Barriers – Defence Estates (with Tavistock Institute)
- FUSION projects – Glaxo Welcome
- Andover North Site – UK Ministry of Defence (with Rider Levett Bucknall)
- Heathrow Express project – British Airports Authority
- Heathrow Terminal 5 – British Airports Authority

While these projects each contain important elements of the IPI Model, The Andover North and Heathrow Terminal 5 (T5) projects in particular demonstrate considerable effort to integrate the design and construction team by developing shared responsibilities for project outcomes, including shared risk and reward across the project team. Additionally, both projects demonstrate early forms of single project insurance, and a brief review of project arrangements for these projects will help set the context for the description of the IPI Model presented in Part 2 below.

Collaborative working - Andover North

The Andover North project was a new £40m office development for the Defence Logistics Organisation (DLO) near Andover in Hampshire, completed in October 2002 (see NAO, 2005). The work was let on a Prime Contract by Defence Estates (DE; now the Defence Infrastructure Organisation), an executive arm of the UK Ministry of Defence (MOD). Prime Contracting had emerged in the late 1990s as the MOD's preferred procurement approach, designed to integrate the project team under a 'single point' lead taking overall responsibility for design and construction – and, potentially, for the operation and maintenance of facilities also. A key aim of the approach was to encourage the development of long term relationships between customer and supply chain (and, crucially, among supply chain members), such that effective collaborative working would evolve and construction supply chains would become more stable (see, for example, Dainty et al, 2001; Cain, 2003).

[2] There is now an extensive literature ('grey' as well as academic) covering a wide range of issues relating to what collaboration involves and how it might be done effectively. An account of this literature is outside the scope of this report; a companion paper (Collinge and Connaughton, forthcoming) provides a useful review.
[3] See Integrated Project Initiatives (2014) *ibid*, p4.

The Prime Contracting approach evolved throughout the early stages of its implementation. Pryke and Pearson (2006) in an examination of an MOD project, for example, notes some of the problems that arose as risk was being transferred by the prime contractor to leaders of supply chain 'clusters' (essentially multi-trade works packages) assembled to help integrate design, production, and financial and project management. In some cases, cluster leaders had little experience of managing cross disciplinary finances. Further, they also lacked the necessary insurance cover (Professional Indemnity) when their responsibilities crossed disciplinary boundaries, thus exposing them to additional risk (pp539-541; 543-544). The Andover North project incorporated a range of mechanisms designed to avoid such shortcomings and encourage more effective collaborative working.

The Prime Contractor (Bucknall Austin/Citex) was appointed for design, construction and, in addition, for maintenance of the building fabric and engineering services for six and a half years after completion. Bucknall Austin/Citex created a virtual company (Bucknall Austin Prime Solutions) comprising clusters of key design, construction and maintenance specialists to deliver the contract as a single team in an alliance with the client (DE). The approach was intended to promote an equitable sharing of risk and reward among all team members and a strong collaborative 'ethos'. The intention was that all parties would work together to develop shared solutions and to resolve problems when they arose, rather than attempting to place risk (and potential blame) on individual team members. Details are provided in NAO (2005) and Constructing Excellence (2005) and, in summary, included:

- An Integrated Project Agreement between all parties setting out how they would work together, defining their responsibilities and establishing principles of equity and risk/reward sharing among them. An important principle was that the parties agreed to a blame-free working culture in which they would collectively be responsible for project risks, and that no claims would be made against each other.
- A Project Board – including client representation – to give all key parties in the project a voice in decision making.
- Early involvement of all key members of the virtual company in the development of the project design.
- A 'pain/gain' mechanism for sharing risk and reward – essentially the parties to the virtual company and the client agreed to share any underspend on the project target cost (in the ratio 30:70) , with the virtual company bearing the risk of any overspend.

- A Project Bank Account (Cabinet Office, 2012) to ensure that all parties in the supply chain are paid on time and to help manage the risk that the prime contractor might unfairly delay or withhold payments due.
- A single professional indemnity insurance policy covering the virtual company for design risks and latent defects.

As will be seen in Part 2, many of these features are developed further and incorporated into the IPI Model.

Collaborative working and single project insurance – T5

While the concept of Single Project Insurance (SPI, whereby all normally-insured risks are covered under a single policy) in construction is not new, examples are rare and tend to be limited to large infrastructure projects and building programmes. The Andover North project adopted a single policy providing professional indemnity cover for the parties in the virtual company delivering the project. The Integrated Project Agreement, within which the parties agreed to adopt a no-blame basis of working and not to claim against each other for fault was a key element in this. Indeed, this principle of 'subrogation' is important to the concept of SPI and extends to the insurer who waives rights of recourse against the insured parties[4]. Under SPI therefore there is no requirement to establish fault; all the insured are jointly liable. Avoiding potential questions about which member of the design and construction team might be at fault for a loss is one of the reasons why SPI is believed to support improved co-operation and collaborative working between them – Part 2 provides further details.

The Terminal 5 (T5) project at Heathrow Airport is an example of the application of an early form of SPI in UK construction – see Wolstenholme et al's (2008) review of the delivery strategy for the T5 project; and also the account by Brady and Davies (2009). The T5 project also represents considerable further development of many of the collaborative working approaches on Andover North, albeit at a significantly larger scale and in a different contractual environment. The T5 project was a very large (£4.3bn) airport terminal development with a five-year on-site program and some six months of operational trials, completed in 2008. Wolstenholme et al note that the client, the then British Airports Authority (BAA), was keen to adopt a 'new' approach to project procurement and delivery to ensure it finished within budget and on time. BAA envisaged the project as a series of interconnected 'products' (essentially costumer-facing elements of the completed project) and sought to assemble integrated teams around these products, focused on

[4] S*ubrogation* is essentially the insurer's right of recourse against whoever has caused or contributed to the loss, so the insurer can recover some or all of the payment for an insured claim from the party at fault.

collaboration and relationship development among the team members involved, with BAA in a leadership role. Each team operated as a 'virtual organisation' (2008, p12) with cross-disciplinary input from consultants, contractors and suppliers intended to provide innovative problem solving and effective solutions to BAA's needs. These are, to a degree, analogous to work 'clusters' on the Andover North project, though are more customer-facing and work without the involvement of a prime contractor.

A key element of the approach was the arrangement for allocation of project liability and risk. As on Andover North, BAA wished to instil a no-blame ethos to encourage more effective collaborative working, and wished to share liability with its suppliers on this basis. Suppliers' liabilities were calculated as a predetermined share (without proof of fault) of the financial consequences of identified risks, and were capped by an amount equivalent to the value of an incentive fund established to encourage innovation and good performance. The idea was to link risk management (essentially the avoidance of events giving rise to liability) to the commercial interests of project participants. However, it was recognised that – partly because of the scale of the project, and the likely consequences of harm should problems arise (Williams, 2008; Wolstenholme et al, 2008) –suppliers could not be expected to cover the potentially very significant and uncertain consequences of all potential failure to meet project objectives. So, while BAA shared in liability, it decided to carry all the risk. It did this through a series of client-controlled 'insurance programmes' for major risks on a project-wide basis covering the whole of the supply chain in terms of all risks, third party liability and professional indemnity.

These 'insurance programmes' are an early form of SPI under which key members of each of the product teams shared in insurance excesses on a no-fault basis up to their liability cap, with losses above the sums insured borne by BAA. As will be seen T5 arrangements contain many of the elements of the IPI Model, though differ from the IPI model in some important respects, principally by:

- being driven by the somewhat unique requirements of a large scale infrastructure project and the nature and magnitude of the costs and risks involved
- having a unique form of partnering contract – the T5 Agreement – with a range of bespoke incentivisation and commercial arrangements
- having a range of 'insurance programmes' which, while covering the liabilities of the project team as a whole, were not integrated into a single policy
- having insurance programmes that were initiated by the client who also took ownership of all insured risk
- not covering time delay and cost overrun.

The IPI Model, builds on many of the Andover-North and T5 arrangements. Additionally, it adopts the FUSION Projects' (Glaxo Welcome) teamworking principles: Fairness, Unity, Seamless, Initiative (subsequently changed to Innovation), Openness and No-blame to assess team behaviour at both the tendering stage, and subsequently during team formation and operation to help guide behaviour under the contract. The approach is discussed in further detail in Part 2; the Fusion principles are discussed in Part 5.

The IPI research project - aims and objectives

The IPI research project

The research project covered in this report was funded under a Research and Innovation contract awarded in 2012 by Innovate UK to a consortium of industry organisations and an academic partner, led by Rider Levett Bucknall. The project was conceived as an Action Research project (see further under *Part 3: Research Methodology*, below) with both development and research aims, as follows:

1. to develop key elements of the IPI Model and apply them on a live construction project
2. to examine the development and application of IPI on a live project, to understand the issues involved and to identify lessons learned for further application.

The industrial partners in the project each contributed specific knowledge and expertise with a focus on supporting key elements of the development and application of IPI in a live setting, as follows:

- Rider Levett Bucknall (overall Project Lead)
- Integrated Project Initiatives Ltd (collaborative working and the IPI Model)
- ActivePlan (web-based toolkit development and best practice dissemination)
- BSRIA (*Soft Landings*, Building Information Modelling)
- Griffiths & Armour (construction insurance)
- Laing O'Rourke (collaborative working; off-site construction)
- Stepnell Ltd (building environmental services design)
- Thomas Telford (alliancing and construction contracts; Thomas Telford subsequently withdrew from the project on as they wished to pursue the development of new forms of alliancing contract independently)

The University of Reading School of Construction Management and Engineering, as academic partner in the primarily industry-based consortium, was responsible for the overall development

and implementation of the research methodology focused on developing an understanding of the key elements of the IPI Model and how they worked in application.

While the primary responsibility for research – including the production of this report – fell to the University of Reading, because of the Action Research approach adopted (see Part 3) there was some overlap between development and investigative activity, with all parties contributing. Additionally, many of the industrial partners were each responsible for the production of research deliverables to capture and help disseminate the learning from the research in their specific areas of expertise as the project progressed. This report draws on these deliverables to present an overall account of the development and implementation of IPI, and of the lessons learned.

The trial project and policy context

The initial proposal for this research and innovation project identified a new construction project for the Defence Infrastructure Organisation/MOD at Lympstone in Dorset as providing an appropriate trial of the IPI Model, with an anticipated completion date of June 2015. In 2014 the Cabinet Office included this construction project in its programme of Trial Projects[5] designed to test new approaches to construction procurement that include key principles of early supplier engagement, integrated team working and collaborative working. However, the MOD Lympstone project was subsequently withdrawn early in 2014 due to a funding shortfall. This resulted in a delay in the Action Research programme until a replacement trial project could be identified.

Later in 2014 agreement was secured to trial the IPI Model on a proposed new Further Education training facility for Dudley College in the UK West Midlands. That project, the Advance II facility, was accepted by Innovate UK as a replacement for the Lympstone project and was also accepted on to the Cabinet Office Trial Projects Delivery Programme later that year.

The Advance II project for Dudley College is described in further detail in Part 4 below (*Advance II: Project summary and key outcomes*) and is essentially an engineering teaching and training block that extends the concept of an earlier development at Dudley known as Advance. The Advance project, completed in early-2015 with an overall investment of some £12m, provides a useful benchmark in terms of cost, delivery programme and overall outcome for Advance II – further details are provided in Parts 4 and 5 below.

[5] The UK Government's Cabinet Office has developed three new procurement models to be trialled in response to the 2011 Government Construction Strategy. In addition to IPI, these are Cost Led Procurement and Two Stage Open Book. See https://www.gov.uk/government/collections/new-models-of-construction-procurement

Key objectives

To support the overall aims of developing and trialling the IPI Model on Advance II, the research reported here had a number of objectives:

1. To observe and document the processes involved in the application of the IPI Model on Advance II, so that they could be understood and explained
2. To understand the likely contribution of IPI to project outcomes
3. To understand the potential benefits and shortcomings of the IPI Model
4. To identify areas for improvement, and
5. To draw conclusions from the application of IPI on Advance II, identifying where appropriate the lessons learned for the development and exploitation of the approach and its application on future projects.

Outline of the report

Following this introduction, the report is structured under seven main sections, as follows:

- **Part 2: The IPI Model**, covering how the IPI Model is meant to work, and its key provisions.
- **Part 3: Research Methodology**, covering the Action Research approach adopted for this project and how this was implemented on Advance II.
- **Part 4: Project summary and key outcomes,** providing details of the Advance II project and the outcomes in terms of the requirements of the Strategic Brief (and covering performance in terms of cost, programme and quality objectives).
- **Part 5: IPI on Advance II – the early stages,** covering the procurement of the Integrated Project Team for Advance II and the early stages of project development leading to 'Commercial Alignment', agreement of the project Target Outturn Cost and submission of the project for IPI Policy inception.
- **Part 6: IPI On Advance II – contracts, payment mechanisms and the IPI Policy,** covering the development and operation of the formal mechanisms that support the IPI Model, including the Alliance Contract, the Gain/Pain Mechanism, the Insurance Policy and issues relating to the proposed Project Bank Account.
- **Part 7: IPI on Advance II – how the process worked**, providing an analysis of how well the main objectives of the IPI Model were achieved, including supporting collaborative working, design/production innovation and other matters including the adoption of BIM and Soft Landings.

- **Part 8: Conclusions**, covering the main project achievements, lessons learned and recommendations for improvement and further work.

Appendices provide background detail on a range of aspects associated with the IPI Model. Note that this report is, in part, a synthesis of other reports produced during the progress of the Advance II project, and appropriate references are made to these reports throughout the text. All these reports are available in a compendium attached to the main research and innovation project consortium report to Innovate UK, of which this research report is a part.

PART 2: THE INTEGRATED PROJECT INSURANCE MODEL

Overview of the IPI model

Introduction

This account draws mainly on published guidance produced by Integrated Project Initiatives (2014). The Integrated Project Insurance (IPI) approach is a "form of procurement that seeks to unlock the potential benefits of integrated collaborative working by:

- Aligning the interests of all team members with the functional needs of the client.
- Assuring solutions are achievable, affordable and delivered in a culture of full collaboration.
- Insuring the outcomes including cost overrun and establishing a pre-determined maximum financial exposure for all parties." (Integrated Project Initiatives 2014, p3)

Insurance is provided by an innovative form of single project insurance that covers the design and construction team as a virtual company (the Integrated Project Team – IPT) in an Alliance with the client for all risks, including third party liability, latent defects, delay in project completion, cost overrun and latent defects. The central proposition is that the IPI Model – including insurance costs – will cost no more than traditional approaches but will deliver significant benefit from improved collaboration by eliminating process waste and delivering improved project performance.

Summary of key provisions

Many of the elements of collaborative working developed on UK projects including Andover North and Heathrow T5 (see Part 1) have been incorporated into the IPI Model in an attempt to provide a workable model for a wide range of construction projects. The key provisions are:

- **The 'virtual company' and the Alliance**: The design and construction team join together in an alliance with the client as a 'virtual company' for the delivery of the project. The Alliance is founded on a 'no blame' agreement similar to that used on Andover North (whereby parties agree not to pursue claims against each other for any fault; see Part 1). Alliance members share in decision making with the client - the Alliance is governed by an Alliance Board with each member company represented, and managed by an Alliance Manager appointed by the Board. Staff are seconded from member companies to form an

Integrated Project Team (IPT) for design and construction, reporting to the Alliance Manager and Board.

- **A focus on collective responsibility**: The Alliance focuses on developing a common understanding of project objectives and shared responsibility for developing solutions to meet them. The underlying principle is that members work together on a 'best for project' basis to achieve project goals and, in situations where problems arise, are jointly responsible for resolving them. To support this collaborative endeavour, a number of mechanisms are in place, including:
- **The Alliance contract**: A new form of alliancing contract supports the IPI Model and contains provisions for:
    - Working together in a spirit of mutual collaboration and trust
    - Sharing of risk and reward through a **gain/pain mechanism** that allows the Alliance to share in the benefits of an underspend on the target cost for the project, and to share in the risks of an overspend (up to an agreed 'cap' – see under Integrated Project Insurance below)
    - Other detailed provisions that generally support the IPI Model
- **Integrated Project Insurance**: To support collaborative working and the sharing of responsibility within the Alliance, project outcomes rather than individual liabilities are covered under a single project insurance policy that provides for the normal insured risks (all risks, public and third party liabilities) as well as latent defects cover for a period of 12 years post-completion. In addition, the policy covers for cost overrun above a financial cap agreed by the Alliance, and up to the insurer's cap. Essentially the financial cap ('pain share' agreed by the Alliance works as a policy excess above which (and below the insurer's cap) the insurer is liable. The client retains liability for overspend above the insurer's cap. As Alliance members and their supply chains waive the rights to claim against each other, so the insurers waive rights of 'subrogation' against all the insured at every tier. The insurer's interest in the project is supported by assessments of risk as the project progresses, provided by **Technical Independent Risk Assessor** (TIRA) and a **Financial Independent Risk Assessor** (FIRA). Note that these appointments were meant to be made initially by the client and novated to the insurers on IPI Policy Inception. It will be seen that this did not happen on the Advance II project as the insurers were content for the client to retain these appointments (see Part 6). This element of the IPI guidance has now been revised and new arrangements introduced – see Part 8.
- **Independent facilitation**: The IPI Model is essentially a facilitated process, recognising that it requires commitments from team members that are different from more

conventional approaches. The model requires an **Independent Facilitator** (IF) who works with the Client from early in the process to establish the project along IPI lines, assists in procuring Alliance members, and generally facilitates the process of collaborative working through to project completion.

The process

Overall

The IPI model is structured under 6 key steps (see the IPI Model map, Appendix A) in four broad phases as follows:

- Pre-appointment and team selection
- Phase 1 – work to identify an agreed project 'solution', agree a target cost and incept (place) the IPI insurance policy
- Phase 2 – work to execute the agreed project solution through to completion, and
- Phase 3 – work to monitor and improve performance in the 12 months post-completion (this includes work in relation to seasonal commissioning, rectification of defects agreed as outstanding at completion; and other activities such as maintenance if agreed and funded.

Pre-appointment, team selection and 'alignment'

The key steps in the IPI Guidance under this phase are:

- **Need**: establishing the business/organisational need for the project, identifying the key stakeholders and determining the investment required
- **Select**: selecting and appointing the parties that will, with the client, form the Alliance and develop and deliver the project
- **Align**: establishing how the Alliance will work together ('cultural alignment') as well as the basis of the Commercial Model ('commercial alignment') governing the commercial operation of the project and the basis for the remuneration of Alliance Members.

The first stages of the **Need** step involve the project client engaging an IPI facilitator (Independent Facilitator – IF) to help with the process of understanding the need for the project, identifying the key stakeholders and possible further advisors (for example, on design and construction matters, and on contract strategy) as a precursor to initiating the IPI Model.

The **Select** process is focused on the development of the strategic project brief and the identification, selection and appointment of the parties that will work together in an alliance with

the client to deliver the project. The IF works with the client through this process and at this stage also the Technical Independent Risk Assurer (TIRA) and Financial Independent Risk Assurer (FIRA) could be engaged in an advisory role – though the TIRA and FIRA roles will continue through to project completion. The strategic brief is focused on a high level description of need as well as on identifying 'success criteria' to help inform those who may tender for the project. The Guidance places an emphasis on selecting and appointing the 'right' people (essentially those prepared to work in the collaborative manner required under IPI) and selection criteria would include proposals for achieving the strategic brief and success criteria, as well as an ability and commitment to work with other parties in a project alliance.

Alignment involves the selected team members coming together in a contracted Alliance with the client, working together to understand the project objectives and likely target cost, and confirming their working arrangements. The parties are those who will participate in the design and construction of the solution that has yet to be identified, and should cover all significant areas/disciplines (including specialist contractors and manufacturers/suppliers) crucial to achieving the success criteria. 'Cultural Alignment' involves a process of establishing how Alliance members will work together, sharing responsibility for project outcomes and working together in a collaborative endeavour to achieve them. Commercial Alignment, in addition to establishing the basis of the Commercial Model (see Part 6) may also include the development of initial cost and time targets to guide the development of Phase 1 work (see below).

A further element of alignment includes Alliance management and governance arrangements. The Alliance will constitute an Alliance Board with each member company represented, and appoint an Alliance Manager for day to day operation. The Alliance members will also second staff from respective member companies to form an Integrated Project Team (IPT) for design and construction, reporting to the Alliance Manager and Board.

Phase 1 – identifying the agreed solution and policy inception

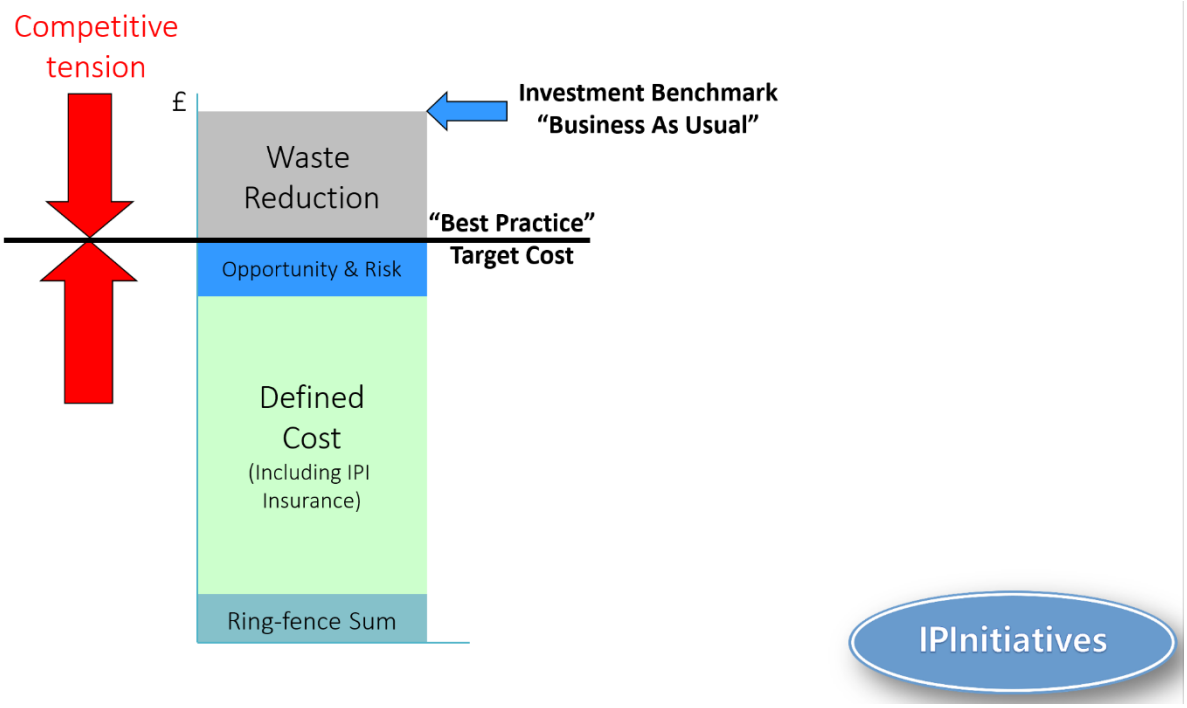
The key steps in the IPI Guidance under this phase are:

- **Prepare**: developing potential solutions to project objectives such that risk can be quantified and a Project Execution Plan (PEP) agreed. An IPI policy for all risks including cost and time overrun is placed ('incepted') at the end of this step.

An initial component of the **Prepare** step (some of the activities of which could also be undertaken as part of Align – see above) involves considering an initial project target cost and how the Alliance will share in risk and reward. As part of Prepare, the Alliance evaluates the strategic brief and success criteria and starts to develop a project cost plan that will lead to the

identification and agreement of a target cost. The idea is that the Alliance is challenged with improving on the client's 'investment benchmark' (derived from knowledge of other, similar projects) to set a 'target cost' that will contain an amount for the team's profit, the cost of doing the work and amount for unforeseen risk (see Figure 1). The target cost provides the basis for the insured cost overrun and work on developing and agreeing it is initiated in the Align step.

Figure 1 – Establishing the Target Cost.



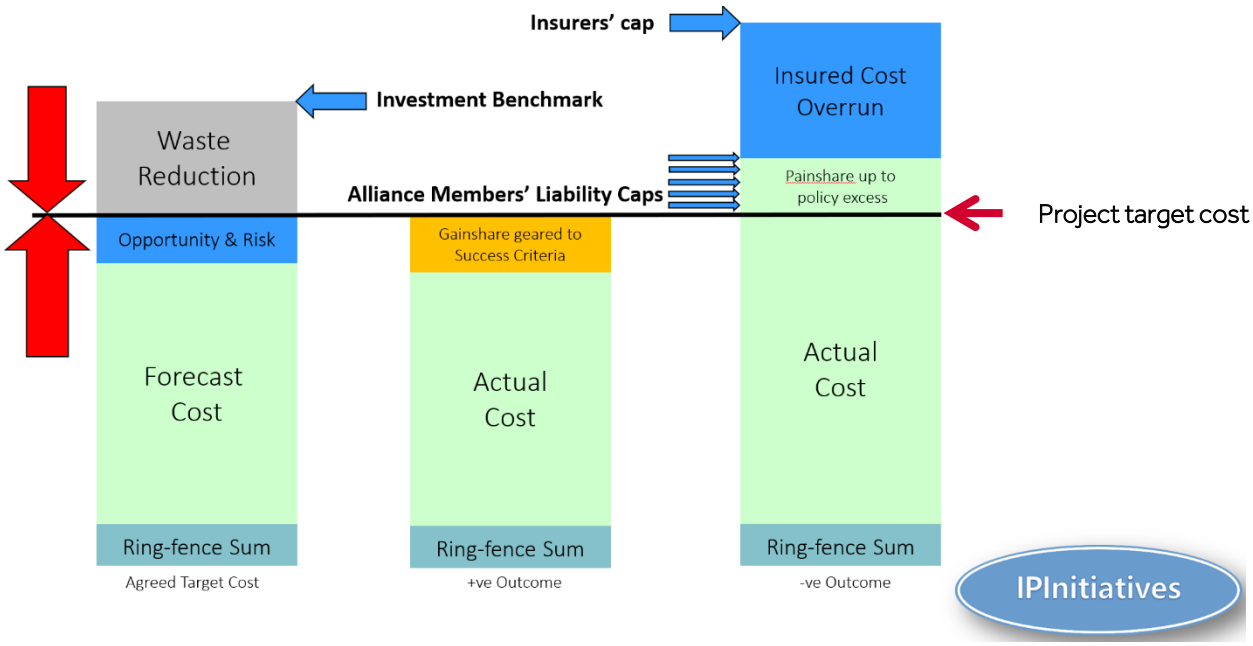
The Alliance also decide how they will share risk and reward via 'gain/pain share' mechanism. This sets limits on members' losses to a pre-agreed share of a maximum sum (pain share), above which – up to a policy 'cap' – losses are insured under the IPI policy. Similarly, members work to a pre-agreed 'gain-share' which is the excess of target over actual cost. Figure 2 below illustrates how Gain/Pain share works by identifying possible project outcomes in terms of outturn cost. At this step also a Project Bank Account (PBA) is established to help ensure timely payment to all key project participants.

The **Prepare** step in Phase 1 is focused on developing potential solutions that will meet success criteria at the agreed target cost. In this iterative process, the Alliance – supported by the TIRA and FIRA – are meant to identify and develop proposed solutions on a 'best for project' basis leading ultimately to a preferred solution that can be achieved at an agreed target cost. At this point the Alliance members confirm their commercial agreement and the operation of the Gain/Pain mechanism that is intended to incentivise all team members to achieve the desired outcome. Essentially, any improvement ('gain') on the target cost is shared among Alliance

members in proportions agreed by them; any increase ('pain') is shared in the same proportions, up to a cap above which the IPI policy provides cover.

This process concludes with the preparation of a Project Execution Plan (PEP) for Phase 2. The IF supports the process throughout and, on completion, provides a report (with the TIRA and FIRA) to the client and insurers, supporting the Alliance proposal for IPI Policy inception.

Figure 2 – Target cost, possible project outcomes and the operation of the Gain/Pain Share mechanism.



Phase 2 – project execution and completion

The key step in the IPI Guidance under this phase is:

- **Execute**: progressing the project through the necessary design, construction and handover stages through to completion.

Following IPI Policy inception, the Alliance works to implement the PEP agreed at the end of Phase 1. **Execute** involves the Alliance and the IPT progressing the further development of design and construction through more detailed stages. The target cost and Gain/Pain share mechanism, together with facilitation by the IF, is intended to help maintain a strong focus on the realisation of improvement opportunities, reduction of risk and elimination of waste. As the team is working in an environment where all Alliance members share collectively in project outcomes, the idea is that unnecessary recording of decisions and activities (to help avoid blame/fault should problems occur) is avoided, and positive collaboration is encouraged. The IF, TIRA and FIRA report to the client and the insurers as the project progresses, and on completion the outturn cost is reconciled against the target cost and Gain/Pain share allocations are determined.

Phase 3 – monitor and improve performance post-completion

The key step in the IPI Guidance under this phase is:

- **Monitor**: supporting the project through the 'Soft Landings' process (UBT and BSRIA, 2014), overseeing seasonal performance and rectifying defects for 12 months following completion.

Under the **Monitor** step the team stays together to support post-project activities, including supporting the *Soft Landings* process and rectifying any defects. Defects identified by the TIRA on completion are rectified and a reserve to cover the estimated costs is included in the final reconciliation against the target costs. Latent defects are covered by the IPI Policy which comes into effect on completion. At the end of the monitoring period the Alliance and IPT will stand down but the contract will only come to an end when the Phase 3 duration expires and all liabilities are settled.

Anticipated benefits

By following the facilitated process outlined above, the creators of the IPI Model believe that an effective environment for collaborative working will be created resulting in significant benefits. These benefits are expected to arise primarily because the project team is focused on project goals and works together to achieve them in an environment that supports and incentivises innovation and cost effective delivery. In addition to the range of measures designed to improve collaborative working, the IPI Policy is intended to shift the focus of team members away from protecting their own interests (and Professional Indemnity cover) towards sharing in collective responsibility for project delivery. In summary, these benefits (described in Integrated Project Initiatives, 2014, pp20-22 and 25-27), include:

- Improvements in overall project outcomes and long term performance, in particular in project quality and how project success criteria are achieved.
- Savings in cost through process efficiencies and from incentivising teams to deliver cost effective solutions that improve on project target costs.
- Savings in project duration by involving key supply chain participants early in the process and by providing speedier resolution of problems as they arise.

PART 3: RESEARCH METHODOLOGY

InnovateUK Research Consortium

Overall research approach and roles of the parties

The InnovateUK Research Consortium (detailed in Part 1: *The IPI research project*) agreed at the commencement of this research project to adopt an Action Research approach. This is described in the following sections. As part of this approach, Consortium partners were involved in research and development activity to different degrees. The majority of research activity was undertaken by the University of Reading, as academic lead. A number of Consortium partners had specific responsibility, appropriate to their expertise, for examining the application and effectiveness of particular elements of IPI as the project progressed (BSRIA, for example, was responsible for supporting and examining the Soft Landings process and BIM adoption). Other partners focused more on the development of procedures and toolkits to support the IPI Model. Active Plan, for example, supported the development and use of the Strategic Forum Integration Toolkit[6] for use on Advance II as well as more widely, whilst other partners provided advice and guidance both to the Advance II Alliance and the InnovateUK Research Consortium. The roles of the InnovateUK Research Consortium partners are summarised in the Final Project Report by Consortium Lead Partner, Rider Levett Bucknall, of which this final research report is a part.

Interim outputs and Work Package Reports

As the research project progressed, the work of individual members of the Research Consortium (organised into a series of distinct 'Work Packages') was reported from time to time in the form of interim reports on key topics that were reviewed and discussed by the Consortium to improve understanding of the IPI Model and guide further research and development. These Work Package Reports provide an important research resource for the project, and a full list is included in the Final Project report by Consortium Lead Partner, Rider Levett Bucknall. Copies of all Work Package Reports are available in a compendium annex to that report. This research report draws on these Work Package Reports and, in some areas, expands on them to provide a more definitive account of project outcomes. This is because, in some cases, Work Package Reports present only an interim review at the point in time of the Advance II project when they were produced.

[6] Available at: http://www.strategicforum.org.uk/current-activities/procurement/integration-toolkit/

Action Research

Introduction and rationale

The University of Reading adopted an Action Research approach for the Advance II project so that the researcher could engage directly with the project participants through a mutually beneficial relationship oriented around learning and knowledge exchange (Reason & Bradbury, 2007). Action Research is a unique research approach that fosters collaboration between academics and professionals whilst opening up a work environment to empirical investigation (Reason, 2003). Unlike other forms of research where the researcher is considered an objective, passive observer, in Action Research the researcher is an active participant in the change process. As such, the methodology is well-suited to a project involving multiple participants who are engaged in a process that is new and innovative (in this particular case the adoption of the IPI Model for the first time). Ultimately, the focus of Action Research is on learning, improving understanding and improving performance through a collaborative and interactive relationship between researcher and practitioner.

Key features

Action Research has a strong pedigree of social justice and community action, with the practitioner actively involved in the 'cause' for which the research is being conducted. It has its` origins in work arising after WWII on productivity in the British coal mining industry and, subsequently, in other industries (Lewin, 1946). Two forms of Action Research are often contrasted as the Southern and Northern traditions: the Southern tradition is committed to community transformation through empowering disenfranchised groups; the Northern tradition is concerned with reforming organisations through problem solving. With its focus on group problem-solving for a practical outcome, and within a commercially-driven organisational context, the Advance II research project is firmly aligned with the Northern tradition (Brown 1993); the aim being for the researchers to help address problems and difficulties on Advance II in conjunction with the project team whilst also learning about project performance under the IPI Model. Whilst the context and use of Action Research varies, there are agreed to be a number of key features which distinguish Action Research from other social science research methodologies. Principal amongst these is the Action Research iterative ‘research cycle’, wherein observations and reflections lead to change (through an ‘intervention’ in the process) and subsequent action. The methodological issues arising from the use of Action Research on Advance II are discussed in more detail in two associated academic papers arising from this research project (Connaughton & Weller, 2013; Collinge & Connaughton, 2017).

On Advance II, the Action Research approach had what may be termed 'Participant and Practical' implications. For project participants, an important implication is that problem diagnosis and the planning of actions were collaborative endeavours between the researcher and project actors. In practical terms, any subsequent actions required the active participation and cooperation of project practitioners. In such a 'Participant/Practical' approach (Chein et al. 1948) the embedded nature of the researcher, working with and alongside more active project participants has been argued to enhance scientific validity. Further, the contribution by members of the project organisation in the research endeavour is also well recognised in recent Action Research theory. The Action Research process continues to be seen as a cycle or spiral of continuous, iterative sequence of activities involving: diagnosis; action-planning; action-taking/observing; reflecting and re-diagnosis leading to subsequent cycles of Action Research (Baskerville, 1999; Argyris & Schon, 1978; Greenwood & Levin, 2007 – see also Figure 3 below). Although criticisms in relation to its replicability, reliability, generalisability and objectivity continue to be levelled at Action Research, it has been recognised as helping to overcome a gap between research theory and practice, and also in improving the relevance and impact of academic research through by having a more 'proactive' orientation. By explicitly rejecting notions of objectivity, the AR researcher is clearly acknowledged as a key participant, lending strength to research aiming for relevance and utility that overcomes researchers' '*self-imposed distance from the world of action*' (Dash, 1999, p.479). Validity is provided by the joint interpretation of the results by all of the participants, not just the researcher. A detailed contextual narrative of the work allows readers to underwrite the accounts by bringing to bear their own knowledge of the situation and context.

Action Research on Advance II

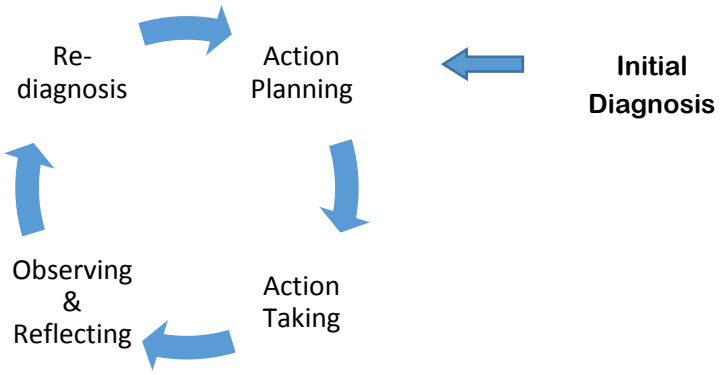
Introduction

As noted, Action Research focuses upon 'real world' problems and their practical solutions; the researcher working in close collaboration with the project professionals to reach collective judgement and agreement on how best to improve outcomes. Action Research on Advance II involved the researcher being deeply embedded in project activities as an active contributor and not solely a passive observer. This translated into activities such as attending Alliance Board and IPT meetings, as well as the meetings of a range of project Working Groups (see Part 5 for management and governance arrangements on Advance II). With this approach, the researcher aimed to assist these Groups, in so far as was possible within the dynamics and constraints of a live construction project, as well as observing and recording the new process of IPI adoption. The

methodological issues arising from the Action Research approach on Advance II are discussed in more detail in Collinge and Connaughton (2017).

In line with typical approaches to Action Research, 'learning loops' were employed on Advance II so that particular interventions of the researchers on the project could be refined through the learning process and re-deployed if necessary (see Figure 3). This process of action taking, observation and reflection leading to re-diagnosis and further action is at the core of the Action Research approach. As beneficial 'action' is fundamental to the adoption of Action Research on Advance II (rather than, say, an interest in its theoretical development), the focus on Advance II was on the functioning of action taking, learning and further development/application as part of a distinct research cycle.

Figure 3: Action Research Learning Loop



The primary purpose of the research was to examine how the project team as a whole worked within the IPI framework (including both Alliance Partners and subcontractors – see Part 5); demonstrating the workability of the IPI Model and identifying opportunities for improvement. Where parties struggled to work within the IPI model framework, the research focus was on exploring how this was overcome and on understanding how the IPI Model supported collaborative working by the project team to improve project outcomes. This involved the use of a range of both qualitative and quantitative data capture approaches as part of the 'Observing and Reflecting' step in the Action Research model, and further as part of a more post-hoc assessment carried out shortly following completion (or following completion of key activities). These are detailed further below in *Complementing Action Research – supplementary data and post-hoc assessment*.

Planning the AR Programme

The Participant/Practical approach ensured diagnosing and action planning was intended to be executed in collaboration with the project players, with agreed actions requiring the active participation and co-operation of practitioners (Zuber-Skerritt, 1996). As noted, this approach is

in line with the "Northern tradition" of Action Research, being concerned mainly with group problem solving for a practical outcome within a commercially-oriented organisational context. The approach was intended to maximize learning and give the project team further assistance with their work, although learning activities needed to be carefully managed so as to not interfere with project work. On Advance II, the AR programme was conducted concurrently by 2 parties:

- The UoR researcher, reporting to InnovateUK whilst assisting the project and research teams.
- The IPInitiatives' Independent Facilitators who guided the project team (including the Alliance, IPT and other team members, including sub-contractors) as mentors, continually observing and encouraging the team to reflect on how IPI was working on the trial project and how actions taken could be improved.

The UoR researcher was primarily responsible for observing and recording project practices, events and performance to help understand the operation of the IPI Model, whilst the IPI Facilitators were focused upon assisting and guiding the project team with their tasks. Therefore, although Action Research recognises the embedded nature of the researcher as part of the community of interest (in this case, the project team), the UoR researcher on this project did periodically need to try to distance himself from activities in order to reflect on progress and performance more from an observer perspective than from that of a direct participant. Additionally, the IF role was more formally constituted to intervene in the project as well as to facilitate and, as will be seen, this at times also became something of a leadership role as the project team relied on the IF's knowledge of IPI to identify a path through the different interpretations that team members sometimes had of what was required under the new process. As a consequence, the UoR researcher took less of an interventionist role at times, though this is also partly due to the highly technical nature of the construction project environment and the researcher's position not forming part of the legally-constituted project team (the Alliance and IPT). This point is returned to under *Diagnosis and Action Planning* below. Primarily for these reasons, the main focus of the approach to Action Research on this project was on the learning stage loop with its strong focus on a cycle of learning and improvement activities helped by both the academic researcher and Independent Facilitators, albeit in different ways and for different purposes. This approach was adopted as a formal element of the research design on this project, in contrast to some of the more implicit approaches to Action Research adopted in less specific ways (e.g. Miller and Dorée, 2008; Chan and Moehler, 2007).

Note that, while some of the other InnovateUK Consortium parties were responsible for examining the use and development of recognised good practice approaches (eg Soft Landings –

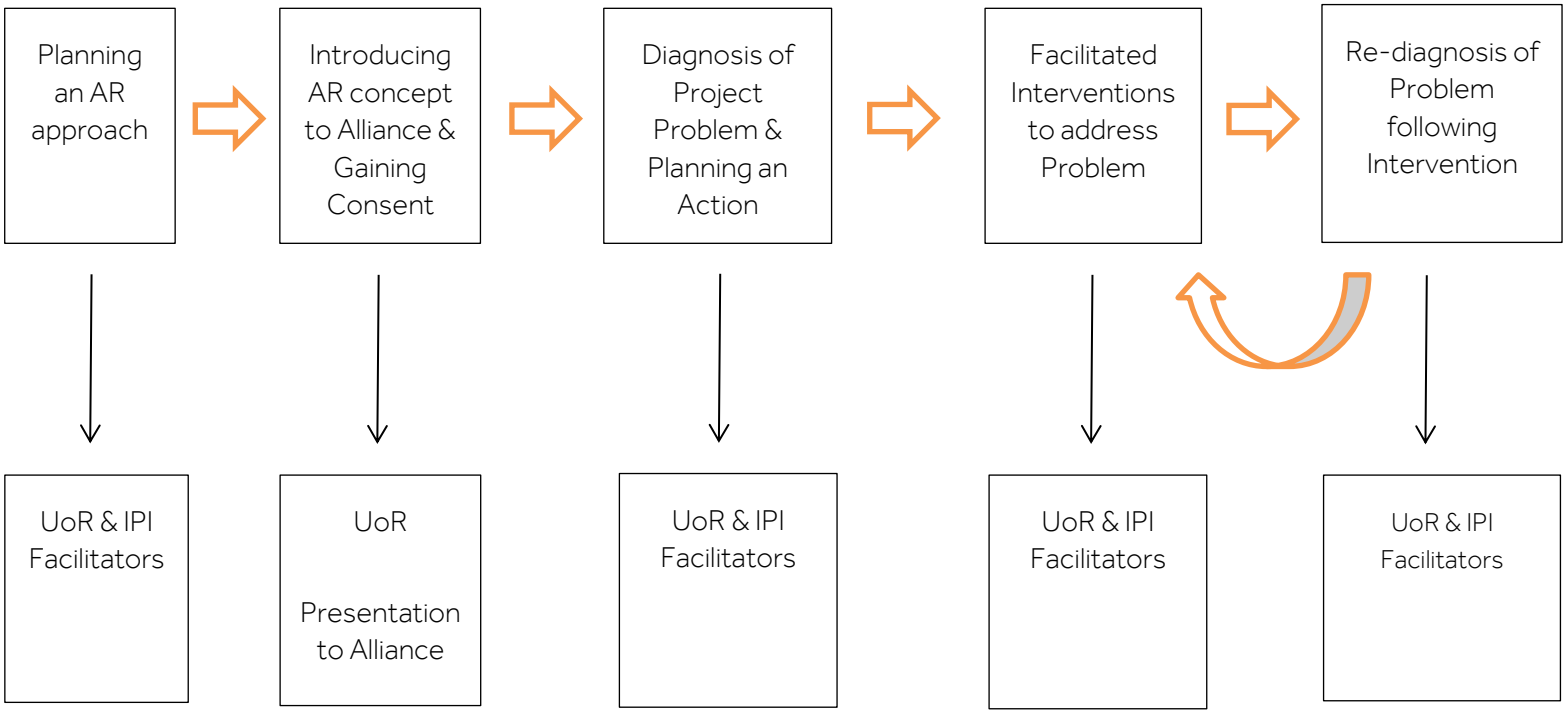
see Part 7) and did this broadly within the overall Action Research process, others did not need to follow this explicitly as their work had broader applicability and was not directed exclusively at the Advance II project (eg work on the development of the Strategic Forum Integration Toolkit; for a full list of InnovateUK Consortium members and their Work Package Reports on this research project, please see the Final Project report by Consortium Lead Partner, Rider Levett Bucknall).

Mobilizing Action Research on Advance II

An overall map of the AR approach adopted on Advance II is depicted in Figure 4.

Figure 4: Roadmap of Action Research on Advance II

For Advance II Research methodology see: Connaughton & Weller (2013) & Collinge & Connaughton (2017)



InnovateUK Consortium: Rider Levett Bucknall (lead)/ IPI Ltd. / University of Reading (UoR) / ActivePlan / BSRIA / Laing O`Rourke / Griffiths & Armour

Introduction and obtaining consent

An essential starting point was to introduce the Action Research programme and obtain practitioner consent. This is a necessary activity for all research studies (not just Action Research), but was particularly sensitive on Advance II as the project was the first trial of IPI in the UK, and a UK Cabinet Office 'trial project', likely to generate significant outside interest. Although the usual obstacles and problems of negotiating access to a project (Laryea & Hughes, 2011) were not encountered (the UoR being part of an InnovateUK-supported research consortium), obtaining the active co-operation of the Alliance partners was an important issue meriting targeted activity. A formal approach was made to the Dudley College client in late 2014, following an initial approach by IPInitiatives. to run a trial of the IPI Model. The Dudley College client agreed to the Action Research proposal early in 2015, as the procurement process for the project (see Part 5) was progressing, recognizing the academic merit of the study. Other Alliance partners agreed as their appointments were confirmed and, when the Alliance Board was formally constituted in March 2015, permission was given for the University of Reading researcher to attend initial Board meetings, though some initial concern was raised by Members about confidentiality in particular. Following reassurances by the University that its Research Ethics procedure would be followed and that, in so far as possible, sensitive data would be safeguarded and anonymized in further publication, the researcher was invited to attend Alliance and other related meetings.

Diagnosis and action planning

With the formation of the Alliance (essentially the governance body for the integrated design and construction team) and the signing of an Alliance Contract for Advance II, a multitude of issues quickly demanded attention and action (e.g. design development; cost planning; procurement strategy; opportunity/risk management; people resource costs). Following the Action Research learning stage loop (figure 1), diagnosis and action planning were initially executed separately by the researcher and Independent Facilitators as each party worked independently. The researcher attended both Alliance Board and IPT team meetings from the commencement of the project (i.e. from the first collective group meeting of the successful bidding teams in March 2015), sitting alongside other team members directly at the 'Board table' itself (i.e. not being inconspicuous, at the rear of the room), commenting and contributing to discussions when appropriate. These verbal contributions were managed very carefully and sensitively by the researcher for several reasons. Firstly, too many verbal interventions could be seen as disrupting the practitioners' work; secondly, time was a valuable resource for all members of the project team; and thirdly, the researcher had limited knowledge of some technical issues discussed (an ill-informed comment or

question may have been viewed as 'slowing down' the work of Alliance partners by requiring them to explain matters). The researcher continually observed and reflected upon the work of the Alliance through meeting attendance and becoming more known to team members as time progressed. For their part, the Facilitators were integral participants at Board and IPT meetings, contributing more vocally than the researcher and advising and guiding the team on best practices when working in an IPI way. As project work progressed, certain issues became more problematic for the Alliance than others, such as agreeing an overall procurement strategy, establishing a collective understanding of risk and opportunity management and re-stating behavioural expectations for project participants. These provided the main focus of the facilitated interventions (the 'action taking' of the AR learning stage loop, Figure 1). On Advance II, the researcher was unable to be present at most, though not all formal project meetings and discussions. Note that the researcher role on this project was not full-time.

Action Taking: Facilitated Interventions

Integral to action taking were the facilitated interventions undertaken by the Independent Facilitators and, to a different degree, the researcher. These interventions aimed to unblock problems, stimulate debate and assist project partners with their work whilst also generating data to help understand the operation of the IPI Model. The Independent Facilitators made many interventions during the course of the project (some planned, some unplanned: see below), but all designed explicitly to improve the operation and effectiveness of the IPI model. In addition to their verbal and written contributions (at meetings; via email; telephone/skype calls), there were numerous Facilitator-led interventions, including the following (more details are provided in Part 5: *Developing the Team – The Facilitation Process*):

- ‘‘Build in a Day’ workshops, essentially facilitated Alliance discussion focused on developing 3D building model.
- IPI training sessions: targeted assistance for the Alliance with the workings of the IPI Model, including the ‘Gain/Pain’ Share Mechanisms; Alliance Contract terms, and the ideal approach to procuring other team members, including subcontractors and specialists.
- Refresher coaching: covering the principles underlying the IPI Model and the behaviours expected of project participants.
- Other, less planned interventions during IPT and Alliance Board meetings (e.g. commenting on various aspects of project development; reminding project participants of of IPI principles and how the process is intended to work, etc.)

Whilst undertaking these interventions, both Facilitators and researcher observed and reflected upon their use with the Alliance. This led to a sharing of ideas of how they could be done differently for subsequent interventions (i.e. the re-diagnosis in the Action Research learning loop). As a result, several interventions were done differently for the next iteration. For example, the format and attendance list for the 'Build in a Day' workshops were revised for the 2nd and 3rd sessions to maximize supplier input; collaborative working principles were more forcibly communicated at refresher coaching sessions in later phases of the project. These are examples of 'double-loop' learnings: those that explicitly acknowledge the context of use within which interventions are mobilized in order to improve their effectiveness.

It is also appropriate, in the context of Action Research, to consider some actions undertaken by the researcher as interventions. These were aimed at assisting project partners to identify learning that could support the adoption of IPI. While they were less directive than those of the IF, such interventions included:

- Presentations by the researcher to the Alliance Board, giving an independent view of project performance and working under an IPI model.
- Group 'Lessons Learned' discussions to enable team members to reflect collectively on working practices and overall performance.
- Reflective Activities: individual and group interviews provided the researcher with data whilst enabling participants to reflect and re-consider issues themselves, leading to potential changes on the project. For example, a small group discussion on cladding and BIM work led in part to the formation of groups called 'Trinities' (see Part 5) to manage commercial, design and delivery issues for separate work packages.
- Specific suggestions: the researcher contributed verbally at meetings with ideas (e.g. suggesting explanation of calculations for Commercial Alignment [see Part 5] should be included in the Alliance Contract Annex; encouraging partners to apply for Corporation Tax Relief as part of an R&D project)

These interventions were managed carefully. For example, interviews with Alliance members were scheduled at convenient times; transcripts were anonymized and returned to interviewees for review (and potential retraction). Obtaining and retaining the trust and confidence of project partners throughout the Action Research programme was essential, so the interventions were reviewed by the researcher prior to further use.

Re-diagnosis

The Action Research learning stage loop (figure 1) is predicated on the assumption that an action can be repeated (following re-diagnosis and modification) for a better outcome. While on Advance II – as on any other building project – there are very many decisions and actions that are not repeatable, there were several examples of actions that were considered and improved for the next iteration. These are covered in some detail in later sections of this report; in summary they included:

- Work Package development: following Facilitator advice, responsibility for project work packages was transferred to 'Trinities' (small 3-person groups representing commercial, programming and design interests) to facilitate better management. The Trinities are explained further in Part 5 of this report.
- Procurement: initial informal approaches transformed into more formal engagements with accompanying letters of intent and/or modified contract terms.
- Cost management: Facilitator intervention resulted in external reviews of costs by the wider project team, enhancing collective confidence and group ownership of project costing, essential to the IPI Model.
- Workshop formats: "Build in a Day" workshops formats were refined iteratively, improving outcomes for all participants.
- Coaching: group training in IPI philosophy transformed into individual coaching to help some team members to work in a collaborative project environment.
- Look Ahead review meetings: format changed following Facilitator advice to include key site supervisors, site requirements and latest information.

These examples illustrate the value of the learning stage loop in action: re-diagnosis of an issue resulting in refinement and better execution. However, as noted, it is not always possible or desirable to repeat an action for a better outcome in a construction project context – examples are many and include the bidding and selection process; numerous build and installation activities; and so on. .

Complementing Action Research – supplementary data and post-hoc assessment

While Action Research on Advance II implies an emphasis on the 'in-the-moment' experience of being embedded in the project team – with direct exposure to many of the dynamics of project decision-making and opportunities for observation – it also provides opportunities for reflection and consideration of the actions and decisions taken on a day-to-day basis. These elements are

outlined as part of the Action Research approach above and were focused on the dual purpose of both supporting the adoption and use of the IPI Model on Advance II, and also in learning from it. Additionally this research report draws on other data and research methods to complement and extend the learning element in particular. This is principally so that further analysis and reflection can be undertaken to help enhance understanding of how the project operated and to provide an initial assessment of the usefulness of the IPI Model and its potential contribution to project outcomes. This additional data, and associated collection and analysis methods mainly involve consideration of the more formal, written record of project decisions and actions, as well as capturing the views of participants in the process.

Supplementary data

The written project record was, in the main, accessible by the UoR researcher on this project and provides an extensive and generally contemporaneous account of key project developments and decisions. The formal record comprises a range of project documents, including:

- Procurement documentation, including published Contract Notices; Invitation to Tender (ITT) and Pre-Qualification Questionnaire (PQQ) documentation issued to potential bidders incorporating the strategic brief and project success criteria
- Contract and other documentation, including the Alliance Contract and Annexes, including the Commercial Model and the Gain/Pain Share Mechanism (see Part 6); the IPI Policy and supporting documentation
- Project working documents produced by Alliance Members and the IPT, including the Project Execution Plan (PEP) and the BIM Execution Plan (BEP)
- A range of project-related technical documents, including multiple versions of the project Cost Plan and Programme; organisation charts; role descriptions and other management documents
- Meeting records, including formal minutes of the Alliance Board and IPT, and minutes (where produced) of various project Working Groups.
- Reports, including those issued by the TIRA, FIRA and IF throughout the project duration
- Some correspondence in relation to key issues, including Policy Inception and the agreement of the final outturn cost.

All this material was used in the account of the project presented in Parts 4 to 7 of this report.

Post-hoc assessment

An important component of the additional research undertaken on this project was the capture of participants' accounts of their experience of the IPI Model and their views, post-hoc, of how this contributed to project outcomes. This was done in three main ways:

- During the project, as part of the Action Research approach outlined above, via semi-structured interviews with individual participants on their experiences and views of key processes and activities shortly after they happened (eg following IPI Policy Inception, to understand participant's views of the process and how it may be improved; and during the project to understand participants' views of whether the Alliance Contract was working as intended and how it supported collaborative working)
- At project completion, via a 'Lessons Learned' workshop, involving all key members of the Alliance (including the client) and facilitated by the IF, to capture in a team environment, useful learning from the project and suggestions for improvement
- Shortly following project completion, again via semi-structured interviews with individual participants (principally the Alliance Members – including the client – as well as representatives of the TIRA, FIRA and IF) to consider, in a more private setting, their reflections on the process of adopting IPI on the project and their views of how it contributed to project outcomes.

The organisations participating in these interviews and workshops are identified in Appendix 2. Semi-structured interviews were conducted using an interview schedule, and the 'Lessons Learned' workshop was also managed using a structured agenda. Sample copies for the in-project and post-hoc interviews, as well as a copy of the Workshop agenda are provided in Appendix 2. The researchers took contemporaneous notes during interviews and at the workshop. In addition, all interviews and workshop discussions were recorded and transcribed for analysis. This qualitative data was coded and analysed using nVivo software to help identify common and emerging themes relating to a range of aspects of the IPI Model (copies of the coding framework can be made available on request). Analysis of this data, together with the researcher's involvement in the project and the analysis of the formal written record provides the basis of the analysis and conclusions presented in Parts 4 through to 8 of this report. The interview and workshop data in particular are used to provide quotations to help illustrate participants' views of key developments on Advance II.

PART 4: ADVANCE II – PROJECT SUMMARY AND KEY OUTCOMES

The Advance II project

Background

Dudley College is a general Further Education (FE) college in the metropolitan borough of Dudley in the UK, providing vocational and technical education and training in the borough and wider West Midlands area. Since 2009 the College has been engaged in a major capital programme of estate rationalisation and expansion focused on its campus on the Broadway in Dudley, known as the Dudley Learning Quarter. As part of this programme, a number of new teaching and training facilities were developed, including *Dudley Advance*, a specialist centre for the study of engineering and advanced manufacturing, completed in 2014. Earlier that year, the College began the process of developing a similar project to be constructed on a site adjacent to *Dudley Advance* to provide for the relocation and development of construction craft trade and skills provision, with a particular focus on modern methods of construction and Building Information Modelling (BIM) techniques. Initially called CABTech (Centre for Advanced Building Technologies), the project subsequently became known as *Advance II*.

Early developments and Advance II

While the early stages in the development of most capital projects are difficult to establish with any precision, the commencement of Advance II for the purposes of this report began in the early part of 2014. The Dudley College Principal and Director of Estates were first made aware of IPI by their special adviser, the late David Bucknall, who arranged for IPInitiatives to make a presentation about how their past problems could be avoided. During these discussions the College representatives noted that, while some of the projects in their estates programme had been completed satisfactorily, they had also experienced delays, cost overruns and contractual claims on others. They were interested in the potential of the IPI Model to deliver more certain and improved outcomes through supporting collaborative working among the design and construction team. As a leading provider of education and training for the construction sector, the College also believed in the value of trialling a new construction and procurement approach that could provide potential benefits and learning not only for the College but for the wider sector:

> *"The vision of the building was always that it was going to be way more than just a teaching space, and that it would exemplify the industry that we were teaching the skills in. The building would be a teaching tool in itself …."* (College Principal/CEO)

By mid-2014 the College confirmed their intention to adopt the IPI Model on CABTech/Advance II. IPInitiatives were appointed as Project Advisors and Independent Facilitators under the IPI Model, and to coordinate the risk assurers (TIRA and FIRA) to be appointed by the College. IPInitiatives worked alongside the College's retained consultants (MDA Consulting, providing initial cost and procurement advice) to support project set-up and to help manage the selection and appointment of the delivery team that would form part of the Alliance.

The Project: scope and overall aims

IPInitiatives's work with MDA and the College in the summer months of 2014 focused on helping to develop the scope of the project, as well as supporting discussions with project funders (including the Black Country Local Enterprise Partnership – LEP). This activity corresponds to the first **Need** step in the IPI Model (see Part 2 above, and Appendix 1). The project scope was captured in an initial Strategic Brief produced in September 2014. CABTech/Advance II was defined as the development, design and construction of a new education and training facility to accommodate up to 500 students per year, together with 30 staff and a range of workshop facilities and equipment, and ICT provision.

An initial investment scope of between £10m and £12m was identified as likely to be required, subject to further refinement as the project brief developed. This was on the basis of previous experience on *Dudley Advance* as well as early advice from the College's retained cost consultants on likely investment requirements for projects of a similar scale and type. Additionally, the Strategic Brief identified an anticipated project completion date of Spring 2017.

An important element of the IPI Model is the development of 'prioritised success criteria' against which the success of the project can be monitored and assessed. These were developed primarily in discussions between IPInitiatives and key College representatives alongside the Strategic Brief, with College representatives confirming their key requirements and priority order on the basis of a simple ranking. While these were used in the procurement of the Alliance partners, they were subsequently refined by the Alliance in the early stages of design development - see further below – and finalised in November 2015 (a copy is also included in Appendix 3).

Procurement of the delivery team

A key element of IPInitiatives's appointment was to support the development of a procurement process for the selection and appointment of the potential partners for the Alliance that would help these bidders understand the key requirements of the IPI Model and also provide the basis for assessing their potential to work collaboratively. This activity corresponds to the **Select** step in the IPI Model. This step also required the development of a process that would comply with the

UK Public Contracts Regulations, often referred to as the 'OJEU process'[7] (for a brief guide, see Crown Commercial Service, 2016; Part 5 below reviews OJEU compliance aspects and how the procurement process was amended in the light of expert advice). IPInitiatives, working with MDA Consulting and College representatives, developed the Strategic Brief and Prioritised Success Criteria into a Pre-Qualification Questionnaire (PQQ) document for use in the procurement of the delivery partners. An OJEU Contract Notice for Advance II was published in September 2014, inviting pre-qualification submissions from interested parties for a range of design and construction services.

The procurement process – including the selection and appointment of the delivery partners – as well as the process of forming the Alliance and agreeing the Alliance contract (the **Align** step in the IPI Model; see Appendix 1) is examined in more detail in Part 5 below, looking at the early stages of IPI on Advance II.

Agreed project success criteria and overall project timeline

The detailed processes and activities involved in the procurement, design and construction of Advance II through to completion are examined in more detail in Parts 5 to 7 below, with a focus on understanding how the IPI Model operated and its likely contribution to project outcomes. It is useful to consider briefly here the finalised success criteria agreed by the Alliance, as these provide clear requirements against which outcomes may be assessed. Consideration of the overall project timeline also helps put the brief presentation of project outcomes that follows this section in context.

The strategic brief and success criteria presented in the PQQ were reviewed by the Alliance in the early stages of project planning and development, and used to help guide and inform early stage design development. They were finalised in November 2015. Key changes included confirmation of the total project cost/investment target of £11.685 million (from £10m-£12m in the PQQ), though this included an additional allowance of £0.75m for College Furniture, Fixtures and Equipment (FF&E) and other items not in the Advance figures. Additionally, the 'aspiration' to achieve a BREEAM Excellent rating for the facility was removed – while the client was keen to pursue a strong sustainability strategy, with a focus on energy efficiency and CO_2 reduction (see below), it felt that not all the BREEAM criteria were relevant.

[7] These Regulations implement the European Union Procurement Directives in the UK, and govern construction works and services procurement above certain value thresholds for publicly-funded organisations like Dudley College. An important requirement is the advertisement of the project opportunity to potential suppliers across the European Union via the publication of Contract Notices in the Official Journal of the European Union (OJEU).

Revised success criteria are presented in Appendix 3. Prioritised success criteria were:

1. Total project cost not to exceed £11.685 million
2. Completion in Spring 2017 at a cost below the agreed target cost
3. Providing an exemplary quality facility with an inspiring learning environment
4. Exploiting 'function over form' to maximise cost effectiveness
5. Deploying new methods of construction to eliminate waste
6. Creating 20 apprenticeships and a live training environment during construction
7. Adopting leading BIM methods from commencement
8. Creating a durable, robust and easy to maintain facility
9. Adoption of 'leading edge' practices by all involved in design, delivery and operation
10. Ensuring the facility is flexible to meet future changes in demand and training methods
11. Creating a design statement (of quality) for the Dudley Learning Quarter
12. Saving 146 tonnes of CO2e in operation
13. Using locally-based people and businesses for project delivery
14. Providing a well-organised and clean site during construction
15. Achieving an EPC 'A' rating (modelled energy performance)
16. .Accommodating craft skills training in a distinct area to preserve 'high tech' space
17. Achieving exemplary health and safety and environmental performance.

Overall project timeline

An outline timetable of key activities for Advance II is shown in Table 1 below.

Table 1. Advance II Overall Timeline

Timing		Key activity	IPI Phase/Step
2014	May	Appointment of IPInitiatives as Advisory Team	Pre-appointment Need
	Aug	Development of initial strategic brief/success criteria	Need
	Sep	OJEU Contract Notice placed	Select
	Oct - Nov	PQQ returns assessed and ITT issued	Select
2105	Jan - Feb	Tender returns evaluated; post-tender workshops held; Partners selected and 'cultural alignment' commenced	Align
	Mar	Alliance Board formed and 'commercial alignment' commenced	Align
	May	Alliance Contract signed by the Client; Phase 1 commenced	Phase1 Prepare

	May - Dec	Design development progressed; strategic brief finalised; target cost plan agreed; request for IPI Policy inception submitted		Prepare
2016	Jan - Feb	IPI Policy negotiations concluded and Policy incepted (end Feb)		Prepare
	Mar-May	Design progressed; on-site construction commenced (May)	Phase 2	Execute
	May-Dec	Design/on-site construction progressed		Execute
2017	Jan-Aug	Design/on-site construction progressed		Execute
	Sept	Facility handed over (8 Sept); completion achieved	Phase 3	Monitor
	Post-Sept	Operational evaluation (including 'Outcomes Workshop')		Monitor

Overall outcomes

Introduction

At the time of finalising this report (January to February 2018) the Advance II project had reached Completion (on 8 September 2017), the facility had been handed over to the College and had been occupied in preparation for the start of the academic year later that month. In addition, the Alliance had been working to resolve a number of matters relating to outturn cost. These were agreed at a meeting of the IPT members of the Alliance and the client on 29 November 2017. The following discussion of project outcomes takes account of this agreement, as well as reflecting what is known of the project from close observation by the UoR researcher since May 2015, and discussions with key participants. While IPI Phase 3 had also commenced at this time, this report does not cover the activities in that phase of the process.

Monitoring success criteria

The success criteria recorded in the revised Strategic Brief were used regularly by the IPT to help guide design development. From September 2016 onwards, progress against the Success Criteria was a formal agenda item at Alliance Board monthly meetings. The idea was that the IPT would report on the extent to which it expected criteria to be achieved using a 'tracker' schedule with a simple colour coding "traffic light" system (green; amber; red). The success criteria in the tracker were also expanded to include project 'Acceptance Criteria' (essentially covering more detailed accommodation and servicing requirements – see Appendix 3).

In practice, while the tracker was reviewed at each monthly meeting of the Alliance, it was not always populated with detailed data or explanations from the IPT about the respective status of each criterion. This was partly because a good deal of detailed information was already available from other sources for Alliance Board review (including, for example, the detailed Opportunities and Risk Register, Cost Plan and TIRA and FIRA reports) on progress against key project targets, including cost and design/performance issues.

Towards the end of the project, the IPT revised and updated this tracker, so that by the July 2017, at the Alliance Board meeting (the last meeting before handover on 8 September), a detailed analysis of expected achievement against all the success and acceptance criteria could be reviewed.

Overall project outcomes against success criteria

A summary table of achievements against the agreed prioritised success criteria is presented below. This is based primarily on the IPT/Alliance's own assessment provided in the success criteria tracker schedule, supplemented by commentary and observation from other participants in the IPI Model including the IF, TIRA and FIRA. Further background is provided in the accompanying InnovateUK progress reports:

- Work Package 33: Review of the IPT's achievements at completion (WP33)
- Work Package 37: Review of Innovation achieved (WP37)
- Work Package 38: Review of Outcomes against Success Criteria (WP38)

It must be noted, however, that these reports were produced in accordance with the InnovateUK research project programme (see Part 1), prior to the completion of Advance II, and therefore are focused more on progress and anticipated achievement at that time, rather than on an assessment of achieved outcomes following handover. For example, *WP38: Review of Outcomes against success criteria* is based on the Alliance Board's review in April/May 2017, which was revised on the production of an updated tracker schedule for the July 2017 Alliance Board meeting.

In general terms, project outcomes are as follows:

- **Quality**: meets and, in many areas, exceeds key quality and performance criteria.
- **Time**: some 4 weeks late on a construction programme of 66 weeks
- **Cost**: small cost overrun on the Target Outturn Cost (c.1.8%); achievement of the overall Investment Target of £11.685m with the addition of some £0.75m (6.4%) provision for FF&E and other items. The small overrun in the Target Outturn Cost results in a Pain

Share borne by the Alliance, but does not give rise to a claim against the cost overrun cover in the IPI Policy.

More detail on performance against these broad parameters is provided following Table 2 below.

Table 2. Achievement of prioritised success criteria and contractual requirements

Strategic Brief Success Criterion		Contractual requirement	Advance II Outcome
1	Total project cost not to exceed £11.685 million	Overall Investment Target £11.685m	Achieved, with additional provision of £0.76m for College FF&E, land costs and VAT (equivalent to a 6.5% 'gain' on the Investment Target). This Part (4) and Part 5 provide further details.
2	Completion in Spring 2017 at a cost below the agreed target cost	Contract Completion 2 June 2017 Extended to 11 August 2017 Target Outturn Cost £9.990m, revised to £9.949m following a Review Event encompassing the effects of delay to Policy Inception and the omission of site drainage works.	Completion 8 September 2017 (4 weeks late) Outturn cost £10.129m (£0.180m [1.8%] above target). This Part (4) and Part 5 provide further details.
3	Providing an exemplary quality facility with an inspiring learning environment	Not altered in Contract	Key stakeholders believe this was achieved with considerable betterment in some area. This Part (4) and Part 7 provide further details
4	Exploiting 'function over form' to maximise cost effectiveness	Not altered in Contract	Key stakeholders believe this was achieved, (see Part 7)
5	Deploying new methods of construction to eliminate waste	Not altered in Contract	Some off-site manufacture in use of SIPs cladding; prefabricated plantrooms; reduction in scope of engineering services (see Part 7)
6	Creating 20 apprenticeships and a live training environment during construction	Not altered in Contract	11 new apprentices used for key trades; project hosted regular site visits from Dudley College trainees (see Part 7)
7	Adopting leading BIM methods from commencement	Not altered in Contract	BIM adopted from early stages under single BIM Execution Plan (see Part 7)
8	Creating a durable, robust and easy to maintain facility	Not altered in Contract	Key stakeholders believe this was achieved; aspects of the Soft Landings approach adopted (see Part 7).

9	Adoption of 'leading edge' practices by all involved in design, delivery and operation	Not altered in Contract	Key stakeholders believe this was achieved; ongoing publication of project progress and developments (see Part 7).
10	Ensuring the facility is flexible to meet future changes in demand and training methods	Not altered in Contract	Key stakeholders believe this was achieved, with betterment relating to increased storey heights and improved fabric insulation (see Part 7).
11	Creating a design statement (of quality) for the Dudley Learning Quarter	Not altered in Contract	Key stakeholders believe this was achieved, with betterment in terms of improved facade (see Part 7).
12	Saving 146 tonnes of CO2e in operation	Not altered in Contract	Modelled energy performance suggests this was achieved (see Part 7)
13	Using locally-based people and businesses for project delivery	Not altered in Contract	Locally based design team and main contractor appointed for project delivery; many local subcontractors (see Appendix 2)
14	Providing a well-organised and clean site during construction	Not altered in Contract	Key stakeholders believe this was achieved (see Part 7 and 8).
15	Achieving an EPC 'A' rating (modelled energy performance)	Not altered in Contract	An EPC 'A' rating was achieved (see Part 7)
16	Accommodating craft skills training in a distinct area to preserve 'high tech' space	Not altered in Contract	Craft skills training and high tech (ICT and CAD/CAM) facilities each located in distinct areas (see Part 7)
17	Achieving exemplary health and safety and environmental performance.	Not altered in Contract	Health and Safety and Environmental audits returned relatively high scores. Only very minor injuries occurred on site (see Part 7)

Quality outcomes

Key quality issues

Quality in construction is complex concept combining a range of possible factors covering design quality (eg the Construction Industry Council's Design Quality Indicator[8]), construction quality (in terms of defects at handover and subsequent rectification), overall fitness for purpose and performance in-use, the extent of any latent defects, and other matters. While the IPI Model does not include any formal assessment of quality, it requires:

- implementation of the *Soft Landings* process (UBT and BSRIA, 2014) intended, amongst other things, to provide an asset that meets the end users' needs and required operational outcomes
- the IPT to support the project through the Soft Landings process, overseeing seasonal performance and rectifying defects for 12 months following completion (see Part 2).

The InnovateUK research report produced by BSRIA in March 2017 *WP 30: Report on IPT priorities to meet the need to achieve Soft Landings* records that, while some aspects of the Soft Landings framework were not adopted on Advance II, there was a strong focus on success criteria from the early stages. The regular use, monitoring and review of success criteria by the IPT/Alliance throughout design and construction has provided an important form of 'reality checking' (a key element of Soft Landings) to help ensure that outcomes meet project objectives. The report also notes the adoption of a Soft Landings framework with specific provision for building commissioning, and the intention of the IPT to remain in place post-completion, during Phase 3. The IPT would oversee the initial stages of the Soft Landings process, including the preparation of a post-occupancy evaluation at the end of the 12 month period, as well as rectifying defects arising. The adoption of Soft Landings is discussed further in Part 7 below.

An overall assessment of quality – primarily in terms of meeting users' needs and the required operational outcomes – can only be made following this period and, indeed, the longer 3-year post-handover period envisaged under Soft Landings. In the meantime, the following discussion of quality outcomes is based mainly on the extent to which the facility is viewed by project participants as meeting success criteria (Table 2 above) together with feedback from individual participants on their more general views of building quality.

[8] Available at http://www.dqi.org.uk/

Outcomes

The majority of 'success criteria' primarily relating to quality (ie most non-time and cost criteria) are, in most cases, expected to be achieved, with many being exceeded – Table 2 and Appendix 3. Additionally, during the process of design development many important criteria were revised to provide improved performance (betterment). Major areas of improvement include:

- Facility designed to accommodate 20% more students
- Aesthetic and performance benefits arising from the high quality façade adopted – though this is subject to 'Review Event' discussions in relation to time and cost outcomes (see under *Cost performance and the Target Outturn Cost* below)
- Development of new arrangements linking IPI and project management process, including BIM implementation.
- Additional flexibility for facility in use and improvements in performance, due to innovative natural ventilation solution adopted:
    - Omission of services zone providing an additional 0.5m storey height in key areas
    - Higher levels of fabric insulation in main workshop ('hangar') zone enables greater future flexibility
    - Improvements in energy efficiency and CO2 emissions
- More flexible teaching spaces, including 'show and tell' elements (prefabricated plant room; structural and jointing detailing; services installation) to assist future training.

These are discussed in more detail in Part 7.

More generally, interviews with key personnel from all the major project participants undertaken in the period immediately before, and shortly after project handover (July to October 2017) suggest a broad agreement that the project has produced a high quality of facility that, in many cases, exceeds the client's requirements. For example, the client noted (early in August 2017):

> *"The quality of what we're getting is excellent from what I can see, obviously it isn't quite finished as yet …, there's nothing in the building I believe is poor. There are certain elements that are really good and certain elements that are satisfactory, but in the main the building as a whole I think will be an excellently finished facility; ...there hasn't been any real need to start chasing quality because it all seems to be at the forefront of their minds. They're already doing their own snagging before we even have to go around and do it. So I think the quality of the building we're getting will be at least as good if not better than we were expecting."* (Client)

The Project Coordinator who was involved in the proving process for the heating and natural ventilation system in particular in the weeks leading up to handover noted:

> *"…what I've got to say has to preceded by the statement that I think it's fantastic and I think the product* [completed project] *will be fantastic, with just … two weeks' worth of proving… and the evidence we've gained is pretty comforting, that we've got a building that is going to work in engineering terms in the way it* [was designed]. *And so a lot of the learning is looking at negative things* [and] *I think that's quite common but I just think, to put it into context, it's been a really exciting experience, yeah."* (Project Coordinator)

Timescale and programme

Key time and programme issues

While the initial completion date for Advance II was identified notionally as 'Spring 2017', the agreed completion date in the Alliance Contract was 2 June 2017 on an overall construction programme of some 56 weeks. At an 'extraordinary' Alliance Board meeting in June 2017 it was agreed by all Alliance Members (including the client) to extend the project completion date by 10 weeks, ie to 11 August, mainly because of:

- Delays in the underwriting process and Policy Inception. The provision in the programme was 3 weeks; the underwriting process took 8 weeks and a further 2 weeks was needed for the Alliance to agree policy terms and costs (see the accompanying InnovateUK research report *Work Package 23 - The process of IPI policy inception*, May 2016). The net delay is 7 weeks.
- Delay in possession of site caused by delay in the (separate) enabling works contract: 1 week.
- Delay due to inclement weather and other issues. Delay in Policy Inception pushed roofing and other works into the winter period and these were subsequently affected by inclement weather: 2 weeks.

The IPT considered that a further 4 weeks was lost, mainly in the early design stages, to agree a Target Outturn Cost, but agreed that these would be absorbed by the partners.

During June and July the IPT worked towards an 11 August Completion date. Towards the end of that period, it emerged that the Approved Building Inspector had concerns about fire safety relating to a cladding detail and was reluctant to issue a Completion/Final Certificate. Alliance members believed this detail would not have caused concern in the past but, in the wake of the Grenfell fire disaster in London in June, fire safety assessment was under heightened scrutiny.

While the resolution of this detail contributed to a further delay of some 4 weeks in total, to 8 September 2017, it is worth noting that this was resolved jointly by Alliance Members, working together (see Part 7, under *Collaboration and Teamwork*).

Outcomes

Although some of the causes of project delay were recognised by the Alliance and agreed as a basis for extending the Completion date (to 11 August 2017), it is noted that this was done retrospectively. As will be seen in the review of cost outcomes below, the Alliance Contract (through a mechanism of 'Review Events') provides for changes to the target completion date and target cost, but requires these to be agreed in a timely manner. This is discussed further in Parts 7 and 8.

A summary of the timing of key events, in terms of planned and achieved deadlines and target periods is provided in Table 3 below.

Table 3 Summary of time/programme outcomes

IPI Model/ deadline	Original plan (ITT)	Contract	Actual	Comment
Phase 1				
Start	24 March 2015	n/a	8 May 2015	Formal start of Phase 1 on contract execution
Alliance Contract execution	March 2015	8 May 2015	8 May 2015	Contract execution delayed due to delays in confirmation of funding
IPI inception (End Phase 1/Start Phase 2)	October 2015	n/a	27 February 2016	Delay in underwriting process
Phase 2				
Start	October 2015	23 February 2016	27 February 2016	As for Policy Inception
Period (approx.)	n/a	56 and 66 weeks	70 weeks	
Completion	Spring 2017	2 June 2017 Amended to 11 August 2017	Completion on 8 September 2017	10 of the 14 week delay agreed by Alliance

As will be seen in Parts 5 and 7 below, Alliance Members considered other explanations for delay on the project in addition to those cited in the Review Event documentation. Principal among these is the time taken to complete Phase 1 work, and the perceived slow pace of development as participants came to terms with the IPI Model and the requirements of collaborative working:

> *"I think the general consensus amongst the team is Phase 1went on too long, we spent too much upfront design, and that condensed Phase 2 for a variety of reasons in relation to getting the insurance accepted, meeting the target costs. There was a whole host of*

reasons and it… resulted in a condensed Phase 2 period to actually deliver the project, which is, in the end, obviously resulted in an overrun…" (Alliance Cost Manager)

Participants' unfamiliarity with the IPI Model and their concern to adopt a collective, participative approach to decision making (discussed further in Parts 7 and 8 below) were also factors:

I'm not sure whether it was part of the IPI because we didn't want to start forcing people to make decisions early on, and the ethos is that we all chat about things and discuss and come up with the best solution. But there were items on the programme that weren't really nailed down for us to be able to… move on and try and bring some rigidity into the programme so we know what needs to be done and when it needs to be done by." (Constructor)

"… if we did …the same job again, we would try to be stronger in trying to, not force people to make decisions, but encourage people to understand the importance of decision making and decision making at the appropriate time. I think we were too willing to please, we were potentially a little bit too optimistic…. We deferred a lot of the time, for all the right reasons, but actually potentially didn't understand the knock on effects further down the line of not closing out a particular decision at a moment in time. (Building Services Contractor)

Cost performance and the Project Target Cost

Key cost issues

The development and agreement of the project target cost (more precisely, the *Target Outturn Cost* – see Parts 5 and 6 below – is also covered in the accompanying InnovateUK research reports *WP22: Processes of updating the cost plan* (issued July 2016) and *WP23:The Process of IPI Policy Inception* (May 2016). However, these reports provide only an initial assessment while the project was in progress, and a more up-to-date and definitive account is provided in Part 5 below under *Developing and Target Outturn Cost – Phase 1* and *Working to achieve the Target Outturn Cost – Phase 2*. Note that the Target Outturn Cost is that proportion of the client's overall budget, on completion, that can be influenced by the Alliance and included in the integrated insurance arrangements. It includes building works but excludes land costs and certain post-completion items, including FF&E, and is therefore the main basis for a consideration of project cost outcomes – see Parts 5 and 6 below.

On Advance II, the Target Outturn Cost, agreed in January 2016, was some £9.99m, including a risk allowance of some £552k – a breakdown from the FIRA Report of 21 January 2016 illustrates

the composition of the target cost (a summary is presented in Appendix 4). This is the 'insurable' cost under the IPI Policy, ie the amount above which a project outturn cost would trigger the pain-share mechanism and, ultimately, the Financial Loss cover under the IPI policy. During the project, the Target Outturn Cost was effectively reduced to account for the omission of the cost of underground drainage works that were part-funded outside of the Advance II contract. However, for reporting purposes the agreed amount of £9.99m was retained and adjustments were made in the FIRA reports via a balancing calculation.

During the process of design development and construction throughout 2016 and 2017, forecasts of outturn cost varied above and below the Target Outturn Cost. From early 2017 the challenges of completing within the Target Outturn Cost were becoming more evident – Part 5 below charts the process in more detail. As the project progressed towards completion in the summer of 2017, the latest available FIRA report (July 2017) suggested that Target Outturn was likely to be exceeded by some £251k - see Appendix 4. This would result in Pain Share by the Alliance under the contract but would not lead to a claim under the cost overrun provision in the IPI Policy – further details are provided in Part 6. In discussions at that time, the IPT members of the Alliance confirmed their view that a significant proportion of this overrun was outside of their control and, further, that additional costs incurred by the IPT were being absorbed by them and not reported in the cost plan. Accordingly, the IPT initiated a Review Event[9] in July under the Alliance Contract to obtain Alliance Board agreement to increase the Target Outturn Cost. This sought agreement of all Board members, including the client, to the costs summarised in Table 4 below.

As was the case with changes to the Completion date, the IPT's submission of a Review Event in July 2017 was done retrospectively, requesting an increase in the Target Outturn Cost on the grounds of developments occurring some considerable time beforehand (eg delays with Policy inception at the end of 2015/beginning of 2016; the selection of the façade option without full IPT input in 2015 – these issues are covered in more detail in Parts 6 and 7 below). An important issue has emerged from discussions with project participants. This concerns views about how the process of collaboration engendered on Advance II may have (inadvertently) encouraged less rigorous contract management and a high level of ambition and optimism about what could be achieved on the project by the IPT. This is simply noted here and developed further in Part 7.

[9] The Alliance Contract contains provisions for 'review events' that allow the IPT to advise the Alliance Board of events that can be expected to have a significant effect on the time, cost, opportunities or risks of executing the project. Such events could, if agreed by the Alliance Board, lead to changes to the target completion date and cost, amongst other things.

Table 4 Review event July 2017 (summary)

Item	Notes	Amount
Preliminaries costs associated with 3 week time extension	The IPT suggest that 3 of the 10 weeks of time extension agreed are subject to increased preliminaries costs due to seasonal affects and inclement weather	£29k
Façade costs	The cost of the façade solution selected by the client early in the process without full IPT input exceeded the cost plan allowance and required additional design effort.	£197k
Project Bank Account costs	The proposed PBA provider was changed by the client and new arrangements had to be negotiated by the IPT	£9k
Insurance Costs	Additional insurance costs (ex taxes), less Brokers fee waiver	£98k
Total		£333k

A formal Review Event submission was made to the client on 25 July 2017, noting that the IPT has, in addition, absorbed costs of errors and inefficiencies which, together with associated overhead and profit, amounts to some £343k. It confirmed that recovery of these costs was not being sought through the Review Event. The approval of the Review Event amount in full would effectively increase the project target cost to above the latest forecast of outturn (and therefore avoid any Pain Share by the Alliance, and the possibility of invoking the cost overrun element of the IPI Policy).

Outcomes

At the time of finalising this report (January to February 2018) the discussions between the client and IPT Members of the Alliance regarding Review Event costs and the Target Outturn Cost had been concluded. While the details of these discussions are commercially confidential, they resulted in a small reduction to the Target Outturn Cost from £9.990m to £9.949m, to take account of underground drainage and Review Event costs. At this time also final outturn cost had yet to be reconciled, although the Alliance Members have forecast this at some £10.129m, suggesting that Target Outturn Cost will be exceeded by some £0.18m (c1.8%). This takes the Alliance into Pain Share but avoids any claim under the cost overrun cover in the IPI Policy. A summary of overall outturn costs compared to agreed amounts as at January 2018 is provided in Table 5 below. Further details are provided in Part 5 and 7.

Table 5 Summary of cost outcomes

Item	Original plan (ITT)	Agreed sum	Actual/outturn	Comment
Investment Target	£10-12m	£11.685m	£11.685m	Includes some £0.75m (6.4%) of FF&E and other items not in initial estimate
Target Outturn Cost	n/a	£9.990m		
Revised Target Outturn Cost	n/a	£9.949m	£10.129m*	Forecast amount; unlikely to change significantly *
Gainshare (all)	n/a		0	
Painshare (all)	n/a		£0.180m	1.8% of Revised Target
Client % painshare	n/a		£0.034m	18.6%
Cost to client (including gain/pain share)			£9.980	

* As at January 2018, not finally reconciled.

Note that the cost to the client, including the clients' Pain Share, is slightly less than the original Target Outturn Cost. Additionally, the overall Investment Target has not been exceeded and in includes significant sums (£0.75m) for additional FF&E and other items not originally included. Further commentary on the Target Outturn Cost and on how the Alliance worked to achieve it is provided in Part 5.

Interviewed early in 2018, following project completion, the client (Dudley College) CEO noted:

> *"We were never trying to save money, we were trying to get the best value for the money we were spending and not be presented with a post project bill – to close down the risk of cost overrun, cost dispute…The quality of the building for what we spent is super, brilliant...It's probably the best quality building we've got per pound, per square metre."* (College CEO)

PART 5: IPI ON ADVANCE II – THE EARLY STAGES

Procuring the Integrated Project Team

The Advance II tendering and procurement process aimed to identify design and construction companies committed to working collaboratively and innovatively in pursuit of efficiency; this collective commitment to collaboration being an essential aspect of any project procured under the IPI Model[10]. A key belief underlying IPI is that better collaboration can produce a superior end-product for the client whilst reducing waste and resulting in financial savings for all parties concerned. In terms of procuring an Alliance team, the IPI Procurement and Delivery Guidance notes how companies should be selected based on this commitment:

> *"The award criteria should support the formation of alliances best able and most motivated to deliver the particular project to an outturn cost some 15% - 20% below the declared Investment Target by cutting waste, not compromising quality or compliance."* IPI Procurement & Delivery Guidance (2014) section 7.

As a result, the Advance II procurement process was geared towards identifying potential Alliance Members that could demonstrate (via written responses, behaviours and interview performance during the selection) a willingness and commitment to working collaboratively and that they could add value to the project.

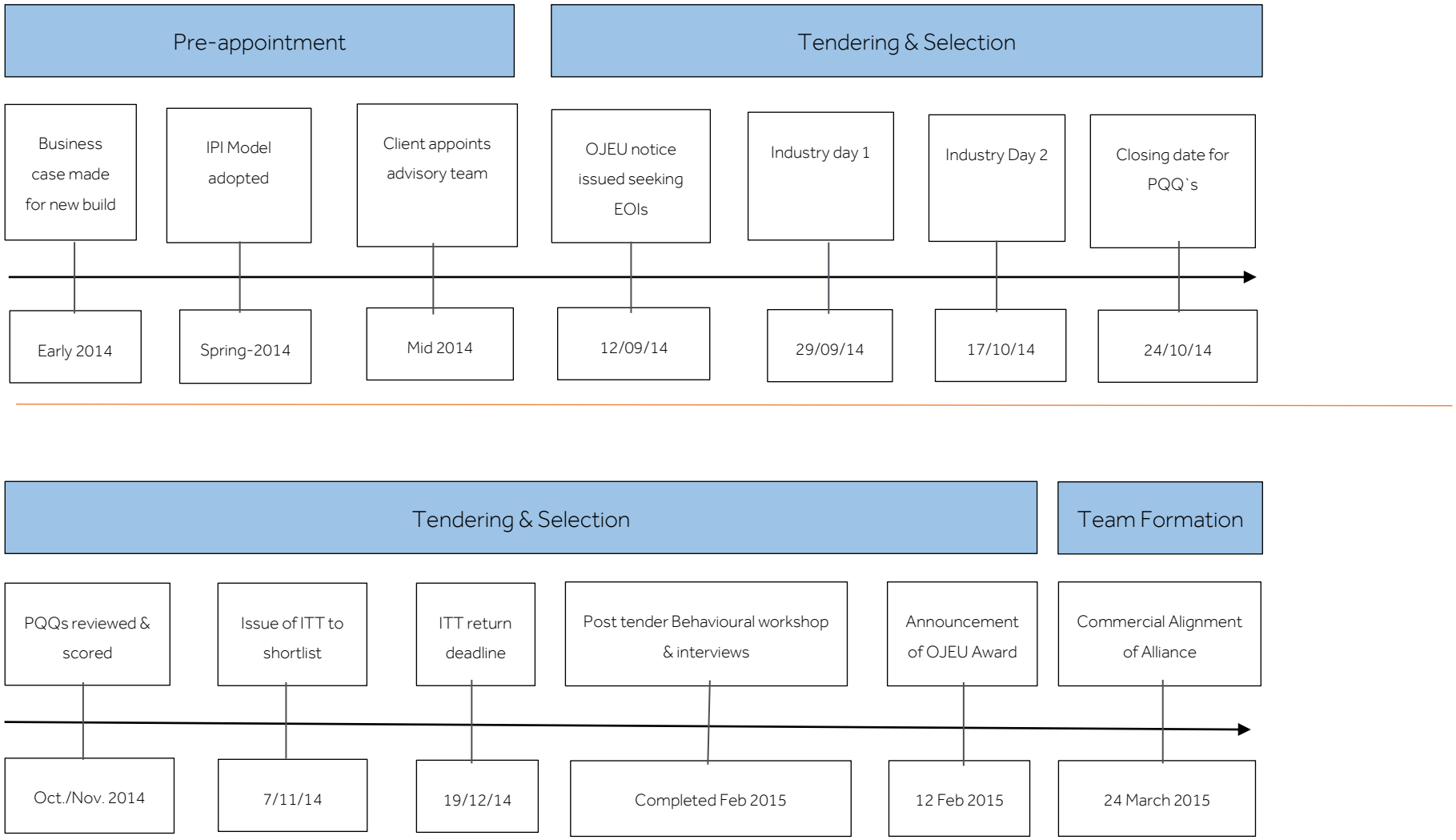
The different stages of the Advance II Tendering and Procurement process are summarised in Table 6 and Figure 5 below. As noted in Part 4 above, Dudley College appointed IPInitiatives. as Project Advisors and Independent Facilitators early in the early part of 2014, initially to work alongside the College`s retained consultants (MDA Consulting) to support project set-up and to help manage the selection and appointment of the delivery team for Advance II. It should be noted that the InnovateUK research team was not involved through the selection and procurement process, nor in the selection workshops detailed in this Part of the report. The account provided is based on discussions with key participants and the written project record.

Table 6 Summary of the Advance II procurement process

Invitation for Expressions of Interest ("EOI") in OJEU	12 September 2014
Return of Prequalification Questionnaires ("PQQ")	24 October 2014
Industry day "IPI" Events	29 September and 17 October 2014
Shortlisting & issue of Invitation to Tender ("ITT")	7 November 2014
Return of "ITT" applications	19 December 2014
Announcement of Award under OJEU	12 February 2015

[10] Integrated Project Initiatives (2014) *The Integrated Project Insurance (IPI) Model: Project Procurement and Delivery Guidance*, 2 July 2014, Integrated Project Integrated Project Initiatives Ltd.

Figure 5: Advance II Tendering & Procurement Process



Tendering Process

A Contract Notice on behalf of Dudley College was published in the Official Journal of European Union (OJEU) in September 2014; the OJEU notice asking for Expressions of Interest (EOI`s) from interested organisations to work on the CABTech project. Parties responding to the EOI were subsequently issued with an initial Dudley College Project Background pack, including a Pre-Qualification Questionnaire (PQQ). These documents provided detailed information about the Dudley College client, a copy of the Strategic Project Brief and notes about the selection process. The PQQ literature was explicit about the ambition and objectives of the project; the use of the IPI model being linked with envisaged achievements, through such statements as:

> *'The CABTech project will provide an exemplar of a high performing energy efficient space delivered using a leading-edge procurement model.* (Advance II ITT/PQQ)

The IPI selection and assessment process was detailed in the PQQ document provided to interested bidding parties and is described below(an extract is attached in Appendix 3).

Parties were invited to submit a completed PQQ that answered a series of questions posed by the Client Team by 24 October 2014. The PQQ questions used questions formulated as on publicly procured projects, and developed in line with the Publicly Available Specification (PAS) 91:2010 (British Standards Institute, 2010), which is a standardised PQQ widely used for construction work by public clients. For each PQQ question and sub-question, a score of between 0-5 was possible; with each score allocation being pre-determined via a description of what constituted that score (the PQQ question module areas and scoring criteria are attached at Appendix 3).

Only PQQs received electronically were accepted (completed PQQs received after the closing date were rejected). The objective of the PQQ evaluation was to identify parties to invite to bid at the next stage from all those companies who submitted a response.

A two stage approach to the evaluation of bidders' PQQ submissions was adopted.

- Stage 1: evaluation of bidders based upon a number of Pass/Fail (or Gateway) questions (a single failure resulting in the Bidder not progressing to Stage 2 of the PQQ evaluation).
- Stage 2: evaluation of bidders through a scoring methodology of responses and supporting evidence provided to questions with a range of criteria.

Bidders were pre-qualified if they met minimum acceptability and financial standing criteria and if they achieved a score of 60% or higher in relation to the PQQ responses.

The questions and criteria were weighted to reflect the relative importance of the question to the capability of the Bidder; scores being allocated appropriately against the evidence provided by the

Bidder using a predetermined scoring regime. Through this evaluation process each Bidder was ranked in terms of required capability and ability to successfully deliver the requirements of the Project. The PQQ was also intended to objectively assess candidates' suitability to satisfy the Client requirements, based on a) their economic and financial standing; b) technical capacity and ability; and c) competencies, skills and suitability.

Pre-Appointment

As noted in Part 4, the IPI selection process was focused upon identifying organisations and individuals willing to work collaboratively and innovatively, and able to demonstrate such qualities through their responses and behaviours displayed via the PQQ, Invitation to Tender (ITT) application, interview process and subsequent behavioural workshops. Under more conventional tendering and procurement processes, bidders' prices and past project track record tend to predominate in the selection. However, on Advance II, the focus was on the quality of the organisations and their people who would make a difference to the performance of the Alliance (a new award criterion allowed under the 2015 UK Public Contracts Regulations (PCR15)[11], Article 67[3]). So bidders for appointment on the project were required to demonstrate their commitment to two underlying principles:

- Collective Team Ethos
- Commitment to Values

The 'collective team ethos' and 'commitment to values' aspects were considered more important for the Alliance than low prices (these principles are included in the IPI Project Procurement and Delivery Guidance: Integrated Project Initiatives Ltd, 2014). They are explored further below.

Collective Team Ethos

The creation of a positive shared team ethos amongst Alliance partners was considered essential for the IPI Advance II project to succeed. The requirement is rooted both in the inter-organisational realties of Alliance working and in the realities of design/construction work when multiple partners have shared objectives and shared financial exposure to delivering a 'best for project' outcome. The Client Advisory Team aimed to identify evidence from bidders' submissions of such team ethos behaviours and practices. The behaviours sought by the Client Advisory team can be defined as follows:

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

[11] Available at https://www.gov.uk/guidance/public-sector-procurement-policy

- Mutual respect between differing disciplines & personalities.

From a broad organisational perspective, an IPI project brings Alliance partners together under a single Alliance Contract and single Insurance policy; this 'virtual company' having shared objectives, shared financial risks/rewards and a shared interest in delivering the best solution for the client. In terms of detailed design, construction and fitting-out work, these shared interests should also translate into efficient, effective and optimal work practices amongst Alliance Members. A collective team ethos is therefore critical and essential at all project levels (i.e. Alliance Board; Integrated Project Team; and site-based delivery teams).

Commitment to Values

The "values" of working as an Alliance were later formalized under the 'FUSION' principles (see Part 1), collectively agreed amongst Alliance partners. Broadly speaking, the values the Client Advisory Team sought to identify may be described under the following requirements, drawn from the PQQ document (Appendix 3):

- Commitment to working in an inclusive, collaborative partnership
- To be inclusive, fair and open with fellow project partners
- To be open to innovative ideas and doing things differently
- To be accountable, resolve problems without recrimination in a spirit of No-blame
- To execute work with collaborative ethos

It was through their initial PQQ responses that companies demonstrated aspects of 'collective team ethos' and 'commitment to values' that the Client Advisory Team were seeking. Essentially, PQQ responses were marked by an assessment panel, established by the Client Advisory team and including a client representative (with criteria and a scoring formulae being pre-agreed). Each bidder was ranked in terms of their overall ability to meet both the Ethos and Values requirements.

Only companies successful at the PQQ stage were invited to proceed to the Invitation to Tender (ITT) stage, the aim being to reach a short list of 2 bidders (and a maximum of 3 bidders) for each separate bidding Lot (see Table 7 below for a description of bidding Lots). Bidders were issued with an ITT if, in addition to meeting the collaborative and team ethos values, they also demonstrated economic and financial standing, technical ability and competencies, skills and suitability. The ITT (and, before that, the PQQ) was the same for all bidders, regardless of Lots.

Industry Days

To enable bidding teams to understand the IPI Model, two separate 'Industry Days' were held prior to the PQQ deadline – see Figure 4 above. The Industry Day events aimed to explain how

the IPI Model encouraged collaborative working on a construction project so that bidders could apply that knowledge to their responses to the PQQ questions. At each Industry Day event, the strategic brief, client expectations and success criteria were presented to company representatives together with the investment target figure and how IPI fitted together with other UK Cabinet Office 'Trial Projects' (i.e. Two-Stage Open Book; Cost-Led Procurement). Additionally, the origins of IPI were explained as well as the principle differences from more traditional construction project procurement approaches (i.e. no lowest cost tendering; adopting a 'no-blame/no-claim culture'). Two Industry Day events were held in order that companies could return on the second day with queries about IPI from the first event.

Invitation to Tender (ITT)

Bidding for the project was divided into a series of Lots (successful bidders being appointed for their capability under individual Lots). Bidders were permitted to bid for more than 1 Lot if they wished. The Lots covered key aspects of the design, co-ordination and construction of the project, as detailed in table 7.

Table 7 Advance II bidding 'lots' for key project roles

Lot Number	Name	Specific Trades
1	Designers	1.1 Architectural Designers 1.2 Building Services Designers 1.3 Structural and Civils Designers
2	Specialist Contractors	2.1 Mechanical & Electrical 2.2 Structural Frame 2.3 External Façade
3	Constructors	
4	Project Co-ordinators	

Interested parties completed an ITT application, providing a full company profile and identifying the key personnel from the company to work on the project. These were evaluated by the Assessment Panel established for the assessment of PQQ submissions (see above) prior to interviews with selected parties.

Interviews

Interviews were then conducted with the shortlisted bidding companies by the Client Advisory Team. The interviews probed each bidding party about their PQQ and ITT submissions. Each bidding team was given a score based on their performance at these interviews.

Behavioural Workshop

Following post-tender interviews, a behavioural workshop was held with bidding parties to validate the assessments made by the Client Advisory Team from previous assessment activities. This workshop required teams to demonstrate their collaborative and team working credentials in a group setting and provided an opportunity for the Client team to supplement the tender assessment. In that sense the workshop was more of a confirmatory exercise for the Client than a formative assessment exercise to generate scores for the bidding parties. The Workshop allowed the selection team to observe how bidding parties responded and reacted to a range of possible project scenarios.

Final Alliance Selection

The selection of the Alliance partners took account of bidders' tender submission, their performance at interview and also how they performed in the behavioural workshop. In making their final decision, the Assessment Panel placed a strong emphasis on selecting bidders that displayed those collaborative and cooperative team-based behaviours judged to be essential for working on an IPI project. The following companies were invited to join an Alliance under the pre-determined 'Lots' of work:

Table 8 Advance II – Outcome of tendering process for key 'Lots'

Lot 1.1	Architectural Designers	Metz Architects
Lot 1.2	Building Services Design & Installation	Derry Building Services
Lot 1.3	Structural and Civils Designers	Pick Everard
Lot 2.1	Engineering Services Strategy	Fulcro
Lot 3	Constructors	Speller Metcalfe
Lot 4	Project Coordinators (incl MEP Model Author/Manager)	Fulcro

No companies bid for the Structural Frame (Lot 2.2) and External Façade (2.3) Lots.

Views of the procurement process

The procurement process on the Advance II project was generally well received by those participating it, on both (supply/demand) sides of the process. Interviewed shortly after the process had been concluded, project participants shared their views on a range of aspects. The IF felt that the process had been successful in both selecting a team with the potential to work well together and in ensuring that bidders understood the aims of the IPI Model and how it would work:

> *"I think it went fine. You look at the team and they seem to be very capable and committed to each other. We don't have anybody who's trying to adopt traditional sets of behaviour so everybody's understood what's different about the intents. I think, for me, it's worked but I'm sure there are things that we can learn from."* (IF)

As noted, the focus of the procurement and selection process was to enable potential members to demonstrate how they could work together to add value to the project. The emphasis given to encouraging potential members to contribute in this way was considered by many of the supplier firms involved to be a welcome departure from more conventional methods of procurement they typically encountered. However, the more intensive engagement throughout the process contributed to a lengthier programme than that normally experienced, which was noted as a drawback of the approach by one interviewee:

> *"I don't agree that the procurement process was quicker. I think actually it took up a lot more time because of the fact that there was a greater need to engage. I don't think that's necessarily a bad thing, because I think the time was put in doing the right things, making sure that the right people in place."* (Alliance Board member)

Reflecting on the selection criteria and what was required to be successful, one Alliance member contrasted the process with more traditional approaches. A particular challenge was to understand what the Assessment Panel were looking for, particularly against the behavioural criteria (including 'collective team ethos' and 'commitment to value') that played a central role:

> *"Although the IPI system followed a very similar process to what we`re used to, it was different information they were looking for and it was more difficult to some extent, especially with somebody like myself who is very analytical in things not have something black and white to mark against, if that makes sense?"* (Alliance Member)

The comprehensive nature of the IPI procurement process also seemed to pose particular challenges for some bidders in the Small and Medium sized category (SMEs). For example, one

interviewee noted how questions relating to quality assurance did not reflect what SMEs could usefully demonstrate:

> *"The PQQ said the process was designed to be SME friendly. But some of the questions there were inappropriate for SMEs…have you got a quality assurance scheme? For a SME that doesn't actually need ISO 9000 because it does relatively simple, work instruction based design of BIM, it would be inappropriate to have a fully blown ISO 9000 overhead in a little business of 18 people. But SMEs have to answer every question…your health and safety question, quality assurance question, environmental performance statement, policy against corruption."* (Alliance Member)

While the PQQ document contained requirements for demonstrating formal compliance with good practice in relation to a range of matters, including quality assurance and environmental performance, for example, it also allowed smaller organisations to provided evidence appropriate to the nature and scale of the Lot being applied for, *and* the size of the applicant organisation. Additionally, some Alliance Members believed the process was well managed and effective:

> *"We found the IPI Model very well run. From the PQQ stage through to the ITT stage, a lot of thought had gone into it and* [we] *couldn't really fault it. Obviously, once we got to the ITT stage, what we were being asked to complete was different to any other ITT that we had completed previously"* (Alliance Member)

Another Board member commented there was ambiguity over certain aspects of the procurement process, with uncertainty over how companies could apply for multiple lots being of particular note:

> *"So I asked the question in the Industry Day to say that I would be bidding all four lots: 'do you want four copies of the generic corporate information?' Because the information you had to provide was a series of project profiles which backed up your capability statement."* (Alliance member)

The same participant also commented on the uncertainty surrounding the identity of those other organisations in the bidding process that would eventually be invited to form the Alliance. While the identities of ultimate design and construction team members is usually unknown at the procurement stage, the intention to form a subsequent Alliance under the IPI Model gives this added significance:

> *"We were offering integrated BIM; so we were offering to do the model authorship of all the disciplines. But because we don't know which architects are going to be appointed, we don't know what their BIM capability is. In the end we proposed that we could do BIM*

authorship in all disciplines together with BIM management and we put it in the budget for [Project] *co-ordinator"* (Alliance Member)

The procurement process on Advance II was well-managed and effective, and resulted in the selection of Alliance Members that the Assessment Panel believed could work well together. As will be seen, the extent to collaborative working achieved on the project may be considered a significant success (see Part 7 below) and, while this is not solely the result of the procurement process, it has nonetheless played an important part.

Complying with procurement regulations

Introduction

The procurement process for Advance II was undertaken in accordance with the requirements of the UK Public Contracts Regulations (see immediately above, and also in Part 4: *Procurement of the delivery team*) and was not subject to any legal or procedural challenge. Nonetheless, IPInitiatives was keen to ensure that all aspects of the process were robust and would survive ongoing 'proving'. In addition, the UK Cabinet Office (overseeing the Trial Projects Initiative, of which the trial of IPI on Advance II was a part – see Part 1 above) was keen that further development and implementation of the various procurement approaches in the Trial Projects programme would be tested on additional projects before the relevant learning could be adopted more widely across the UK public sector. As part of the proving process under this InnovateUK research project, IPInitiatives undertook to obtain expert legal advice (from leading Counsel) to help ensure that the IPI model is fully compliant with the relevant public procurement laws, including Directive 2014/24/EU and corresponding Public Contracts Regulations 2015 (PCR15)[12].

Review of the IPI Model for regulatory compliance

During the development of the IPI Model, and up to its trail on Advance II, IPInitiatives had engaged in discussions, with a number of public sector procurement lawyers and administrators, about how the process would comply with current regulations. The outcome of these discussions helped identify potential queries about regulatory compliance and these helped form the basis of the review of IPI procedures undertaken between April and December 2016. This review was in two stages, involving:

- The initial submission of the IPI Model, highlighting a small number of specific queries, for review by a leading Counsel and expert in public procurement (Sarah Hannaford of

[12] See https://www.gov.uk/guidance/public-sector-procurement-policy

Keating Chambers) in April 2016. Initial advice on the basis of this submission was provided in June 2016.

- A second submission in November 2016, following a review of the initial advice by IPInitiatives and discussion among members of the InnovateUK Research Project Consortium, seeking further clarification of Counsel's advice. Written advice was provided in response to this submission in December 2016.

Key issues and conclusions

Initial submission and response

This submission focused on a small number of technical compliance issues. A summary of the key issues and Counsel's response (in non-technical language) is provided in Table 9.

Table 9: Initial review of IPI compliance with UK Public Contracts Regulations (April – June 2016)

Query	Counsel Response
Whether the approach complied with the 'Most Economically Advantageous Tender' (MEAT) requirements. In simple terms, the IPI Model provides for a mainly qualitative assessment of cost effectiveness, assessing bidders' responses to key questions including how they will manage costs. It does not provide for a more explicit assessment of fixed fee and cost bids (which are not required under the IPI Model).	Counsel noted that the legislation is not clear on this point, but recommended that the approach should include a 'more meaningful' evaluation of cost effectiveness in addition to the qualitative assessment.
Whether the approach to commercial alignment – which takes place after contract award – is compliant.	Generally, the approach is compliant provided Alliance Members are not allowed to make material amendments to bid proposals post-award.
Whether there are risks in prospective Alliance Members sharing their PQQ/ITT submissions.	There is a risk that this could provide Alliance Members with an unfair advantage in subsequent procurements.
Whether the IPI Model could be used as the basis for a framework agreement or a 'dynamic purchasing system' under the Regulations.	The IPI Model could be used as part of a dynamic purchasing system. While it could also be used for framework agreements, further development is required, in particular to accommodate a more meaningful evaluation of cost effectiveness (as noted above).
More generally, whether other aspects of the IPI Model might cause public procurers to be reluctant to use it.	Provided the recommendation on cost effectiveness above can be accommodated, the approach overall does not pose significant procurement law risks.

Final submission and response

Following receipt of Counsel's advice on the key queries raised in the initial review, IPInitiatives made further changes to the proposed arrangements for compliance with the Public Contracts Regulations under the IPI Model. These changes sought to accommodate the advice received and focused on developing a more explicit evaluation of cost effectiveness at tender stage in particular, as well as on other matters. Cost effectiveness would now be evaluated by requiring bidders individually to commit to a 'not to exceed' value for their Lot (which may be expressed as a percentage of the investment target), in addition to the requirement for them to commit (as part of the Alliance) to agree a Target Cost that is within the investment target for the overall project.

The second submission for review by Counsel identified further, mainly technical, issues arising from a consideration of the impact of the proposed approach to cost effectiveness as well as aspects of the initial advice. A summary of the key issues and Counsel's response (in non-technical language) is provided in Table 10.

Table 10: Final review of IPI compliance with UK Public Contracts Regulations (July-December 2016)

Query	**Counsel Response**
Whether the revised approach to cost effectiveness is compliant. This includes a requirement for bidders to commit (as part of the Alliance) to agree a Target Cost that is within the investment target for the overall project. Cost effectiveness will be evaluated by requiring bidders individually to commit to a 'not to exceed' value for their Lot (which may be expressed as a percentage of the investment target). A qualitative assessment will also be used.	Counsel advised that the approach to the Investment Target is akin to fixing the price and evaluating only on quality, which is permitted by the Regulations. The proposed procedure should be set out clearly and transparently in the tender documents. Continuity between tendered costings of staff, etc, and costings of the members of the 'lean team' should also be preserved through Commercial Alignment.
Whether proposed scoring methodologies for the evaluation of bidder performance in 'behavioural workshops' as part of the tender process are compliant.	The proposed methodologies are compliant. The proposed procedure should be set out clearly and transparently in the tender documents.
Whether an Alliance Member can be excluded post contract award and prior to commercial alignment, and replaced by a reserve bidder, in line with revised procedures in the IPI procurement arrangements.	This may be done provided the tender documents and contract clarify that a reserve bidder can be appointed to the Alliance if another member has to be excluded.
Whether revised arrangements for the use of framework agreements in the IPI procurement documents, incorporating revisions to the evaluation of cost-effectiveness outline above, are workable.	Careful consideration is required to ensure that there is a proper consideration of price at call-off stage in line with the revised arrangements.

The detailed submissions and responses that form the basis for this short review, available to the InnovateUK Research Consortium, provide a more extensive account of the formal submissions, subsequent discussions and written advice and substantiate the rigour and extent of the proving work undertaken on this aspect of IPI. They provide strong support overall for the potential to use IPI on public projects in compliance with the UK Public Contracts Regulations. Further details, including a proposed procedure for public sector projects under the IPI Model, may be obtained from IPInitiatives.

Developing the team – the facilitation process

Introduction

Through their contract with Dudley College to provide the Independent Facilitator (IF) function for the Advance II project, IPInitiatives continued their involvement through the procurement process and into the process of forming the Alliance (from early in March 2015). While the process of engendering collaborative behaviours and cooperative attitudes began during the tendering and selection process, this was continued with a series of partnering workshops and group team building activities throughout 2015. Integral to these initiatives was the aim to establish commonly shared behaviours and outlook towards the project; the same behaviours the Client Advisory Team aimed to identify through the selection process.

Alliance principles

Alliance members committed their respective organisations to work with each other collaboratively, formalizing the approach (at Alliance Board level) through the adoption of FUSION[13] principles – see above and in Part 1. The FUSION principles would ideally underpin behaviours, actions & relationships between all partners on the project, including the client, and required Alliance Members to work 'in a spirit of mutual trust and co-operation'. These principles were defined as:

- Fairness – Inclusivity, listen & hear, objective, ethical
- Unity – Consensus, common goal, supportive
- Seamless – Not constrained by personal or organisational processes or boundaries
- Innovative – Challenge the norm, encourage each other, value each other (this was formerly titled 'initiative' in an earlier version of the FUSION principles)
- Open – Honesty, be approachable, be receptive

[13] These principles are derived from a collaborative working approach developed by one of the principals of IPI Ltd on a redevelopment programme for Glaxo Welcome in the 1990s – see http://www.fusion-approach.com/ and Cartlidge (2004; Chapter 7: Procurement – case studies, pp265-272).

- No Blame – Be accountable, resolving problems without recrimination"

The FUSION principles were chosen by the Alliance partners in the Cultural Alignment Workshop on 24 February (see below) as the principles that would guide the work of the Alliance, and were approved by the Alliance Board (2 March 2015) and subsequently placed in the Alliance Contract. The development of Alliance and Integrated Project Team (IPT) personnel to work together collaboratively using these FUSION principles was an ongoing mission for the IPI Facilitators throughout the Advance II project.

Workshops

The IF held a range of Workshops with the Alliance through the period February – October 2015 to help introduce different aspects of the IPI Model, and to help Alliance Members and others to become familiar with the relevant requirements and develop the capability to meet them. Each workshop brought Alliance Member personnel together for a full day of activities. The different workshops are detailed below.

Cultural Alignment Workshop 24 February 2015

An early initiative was to hold a 'Cultural Alignment' Workshop to further foster a team mentality amongst the Alliance partners and determine the principles that would guide Alliance working. The Workshop was both a team building event (bringing Alliance personnel together for the first time since their selection) and an introduction to IPI including some of its formal mechanisms and methods (e.g. FIRA/TIRA roles; the process of Commercial Alignment). The Workshop enabled all parties to get to know each other informally and, with a mixture of inter-personal exercises ('post-it note' idea sharing; physical movement games; company presentations to the workshop attendees) and instructional IPI sessions was an important and well-received event for all Alliance personnel. The FUSION principles were chosen by the Alliance partners as the preferred guiding principles for Alliance working.

Decisions & Activities Workshop 12 May 2015

This Workshop brought Alliance partner personnel together again following a 6-week hiatus period on the project between the conclusion of Commercial Alignment (see below) and the execution of the Alliance Contract. This was due to delay in confirming project funding arrangements and the need for conformance with funders' requirements. As a result, the IF felt the need to re-energize the Alliance and re-animate it. The day was structured around Alliance Members identifying potential issues or problems typically encountered in the different phases of projects (eg, through Outline Design, Detailed Design/Construction, Construction, Completion, Handover and Maintenance) and how they could be avoided on this project by working together

in a more collaborative environment. A series of mapping activities (with post-it notes) and discussion activities were designed to build trust and understanding amongst the partners, although the FUSION principles (see above) often needed to be re-emphasized amongst attendees by the IF. At this point a proposal to use the ADePT Design Management tool was introduced by the Project Co-ordinator which was well received by Alliance Members who agreed to develop the proposal further. Overall, this Workshop can be viewed as an important collaborative event to re-mobilise the Alliance following a hiatus in activity. However, at this point also the first formal briefing event with client was yet to occur and it had not yet been confirmed who would represent the client in this process.

Value Management Workshop 19 May 2015

At the Value Management Workshop, Alliance partners were presented with a 3D image of a proposed structure (developed between Dudley College & Metz Architects during the hiatus period between March and May 2015) showing a preferred façade solution. This design provided a focus for group activities in the Workshop as building functions, contents and facilities were scoped out. A new name for the project (Advance II, not CABTech) was introduced as attendees were invited to discuss Value Management issues and project requirements in more detail (including room sizes and configuration). Alliance partners were also reminded by the Facilitators that the project was now in Phase 1 of the IPI Model, although frustrations were expressed by some present about lack of progress and clear priorities for action since the conclusion of Commercial Alignment (detailed further below) in March. However, there was also relief that work was now moving forward. The IF again worked at reminding participants of the collaborative nature of the project and the need to adopt the FUSION principles in an attempt to reinforce the need to foster a team culture and collaborative 'mindset' amongst attendees.

Planning Activities Day 1 June 2015

A 'Planning Activities Day' brought partners together again to identify and agree an overall project plan and programme priorities. The ADePT Design Management tool and its potential use on Advance II was a focus of attention through the day as discussions also addressed the project Target Outturn Cost and what could/should be achievable on Advance II. The outline façade design (as developed by the architects and client in April/May) provided the basis for design discussions amongst Alliance Members at this event. The IF again performed an active role to inform and steer discussions, particularly on Phase 1 requirements, including the 'deliverables' required at the end of this Phase (ie, agreement of the project Target Outturn Cost and the submission of the project to insurers for IPI Policy inception). The IF also helped the Alliance consider how a range of practical matters – including, for example, sub-contractor engagement and payment – would be handled under the IPI Model. The UoR researcher/observer present at

this meeting believed that this was somewhat more action oriented than previous workshops and Alliance Members were now engaging directly in the practical challenges of delivering the Advance II project.

Target Cost Meeting 9 June 2015

An Alliance meeting was called so that all Members could focus on project cost planning and on the operation of the Commercial Model and the Gain/Pain Mechanism (see further below under *Defining the Target Outturn Cost – Phase 1*, and also in Part 6). This was led by the IF, who presented a tool for the calculation of the incentive scheme (Gain/Pain Share Mechanism), called the IPI Interactive Incentive Calculation Tool, and demonstrated how this would work in different Gain/Pain scenarios. This is discussed in more detail in Part 6 and illustrated in Appendix 5. This was an important event as it helped Alliance Members, following Commercial Alignment, to understand in more detail the need to agree an achievable Target Outturn Cost and the potential implications of either not achieving it or improving on it. Many of the day-to-day practicalities of managing costs on an IPI project were also scoped out at this event as the IF reinforced the message that IPI cost management work is fundamentally different from 'business as usual' (see *Defining the Target Outturn Cost* and *Working to achieve the Target Outturn Cost* below). The meeting also started to allocate initial amounts for different building work package elements (e.g. groundworks; envelope; lifts, etc). Concerns were expressed at this meeting from some Alliance Members about the number of collective meetings expected/required to progress work on the project.

ADePT Feedback Workshop 23 June 2015

A further Workshop in June re-visited the client strategic brief and considered how design work had developed over the previous few weeks. At this meeting the IF was keen to ensure that Alliance Members understood how the different phases on an IPI project were meant to operate and, in particular, the levels of design detail that would be needed for review and sign-off by the TIRA at the end of Phase 1, as well as the contents of the Project Execution Plan (PEP) that would be required to demonstrate that the project is deliverable. Alliance Members were also informed about data requirements of the Common Data Environment (CDE – see under Part 7: *The adoption of BIM*). The ADePT tool was again presented to Members and reviewed by them. There were doubts raised at this meeting about the usefulness of the ADePT tool on the project and, despite further discussions at this Workshop and subsequently, ADePT was not used on Advance II.

Opportunities and Risks Workshop 13 October 2015

One further Workshop was held in October 2015 addressing 'Opportunity and Risk'. This is explained further below in *Defining the Target Outturn Cost* (see under *Introduction – cost management under the IPI Model: The Investment Target*). Essentially the IPI Model requires the Alliance to try to improve on cost targets by identifying and exploiting 'Opportunities' for cost reduction, and by identifying and managing the 'Risks' involved. The event aimed to explain this process to Members as an integral part of cost planning, and the discussion also included implications for the operation of the Gain/Pain Share Mechanism. Following presentations by the IF on the Opportunities and Risk process, a facilitated discussion captured potential opportunities for improvement and cost reduction in the IPI Model. A series of actions resulted from these discussions for IPT Members to take forward. These included an overall review of the project programme; a focused review of the programme for Piling, Groundworks and Frame to inform the master project programme; a resource review by all partners relating to their input to Phase 1 (see also under *Defining the Target Outturn Cost – Phase 1* below); and the development of a procurement strategy for main work packages for further review by the Alliance. And while Opportunities and Risks had been discussed in principle – and a range of potential opportunities for cost reduction identified – these had not been quantified and considerable work remained to include these more formally into the project cost plan. Nonetheless, participants welcomed the opportunity at this Workshop to develop their understanding of how cost planning on the project was intended to be managed under the IPI Model.

Note that further workshops were held on the project – including 'Build in a Day' workshops focused on design coordination and construction/installation issues during Phase 2 – and these are covered in Part 7: *Project delivery innovations* below

Perceptions of workshops

Participants in the Workshops generally believed that these were important events in facilitating a collaborative ethos on the project and creating enthusiasm, both for achieving successful project outcomes and for trialling the new IPI Model in a live project setting. Following the first workshop after Contract execution in May, one Alliance Member was particularly enthusiastic:

> *"We had a really good workshop with a team, we're all energised, all ready to get fired up to go off and work together"* (Alliance member)

Another interviewee described how the Workshops were important in allowing ideas to be raised and discussed, and collective decisions to be taken:

"I think if you embrace the workshops that definitely influenced people in terms of driving things forward. I think it does promote ideas because it goes back to… you set things up at the start, and that will influence what you get. You can`t suddenly decide to do something differently halfway through and expect everyone to embrace it, but certainly, it influences doing things different from the start." (Alliance Member)

Some Alliance members expressed frustration over the number of and range of Workshops held and the consequent demands on their time. For example, an Alliance Board Member (interviewed in July 2015) commented:

"I think we`ve had too many meetings…too many people in my view. And large meetings don`t always lead to a successful outcome. We seem to have spent awful long time on activity workshops and value management workshops. Sometimes I feel like we`re working on a theoretical project, but we`re working on a real project with real deadlines that have got to be hit in terms of time and money." (Alliance Member)

However, other Alliance members (interviewed at the same time: July 2015), were more accepting of the time commitment and more positive about the value of workshops. For example:

"Whilst I might find it a bit time consuming and drawn out, it might actually be a lot more efficient than if it was being done traditionally…so I must hold back with any comments. I think the bit that I struggle with at the minute is I found some of the initial workshops perhaps a little too cumbersome." (Alliance Member: July 2015)

Of course, Workshops were not the only mechanisms for bringing participants together, and the following sections review the formal management arrangements on the project including a range of Working Groups developed to support project delivery. But first it is appropriate to consider the role of the Independent Faciliator (IF).

Role of the Independent Facilitator (IF)

The IF representatives played a prominent role in all Alliance meetings throughout Phase 1, attending Alliance Board meetings, IPT meetings, Workshops, and other project meetings including 3D model review meetings and some of the meetings of the project Working Groups (see next section). Particularly during the early stages of the project, the IF's role was focused significantly on informing the project participants about the requirements of the IPI Model and encouraging collaborative behaviour that the IF believed would help them achieve the project success criteria. A number of IPI 'mechanisms' (see Part 6, including the Alliance Contract, the Commercial Model and the Gain/Pain Share Mechanism) were unfamiliar to participants and also required new terminology and ways of working that they had not encountered before. So many

terms and processes had to be regularly explained, and successive meetings were also used to remind participants about IPI, why it was different and what was expected of participants working in this way. The IF also helped in interpreting the available guidance as problems were encountered. This was a learning process for the IF also, as some of the issues arising had not always been anticipated in the development of the approach – the cost planning process, structured around the 'Opportunities and Risk' approach was one area that the Alliance found particularly challenging throughout Phase 1 and, indeed, into Phase 2 (this is discussed further below). For their part, the IF representatives were conscious of the potentially strong position this placed them in, and were careful not to assume a project leadership position – rather, they saw their role as facilitating and coaching the Alliance Members to establish for themselves how best they could work together. As will be seen, this was not always an easy distinction to maintain, particularly on this first trial of a process that had not been tested on a live project before.

Generally, Alliance Members were very positive about the IF role, recognizing its importance both in clarifying how IPI was intended to work, and in supporting them through the process to achieve the desired project outcomes. This was particularly important in the very early stages of Commercial Alignment (see below) and in agreeing contract terms as they clarified what was needed and confirmed specific terms and conditions in the Alliance Contract and how the IPI insurance product would work. An interviewee noted:

> *"Their attendance is valued because this is a new process to us…I think their experiences are invaluable to assist us in moving in the right direction."* (Alliance Member: July 2015)

The tensions, however, between facilitating a new process and leading it were also noted – interestingly, these emerged early in the project when, understandably, Alliance Members seemed keen to get on and progress the project:

> *"The facilitators are trying to get the Alliance Board to work successfully, including putting together a new structure, but I think in the last two or three meetings they ought to have backed out and let us do things…I think there's a point in time at which you've got to start making headway."* (Alliance Member: July 2015)

The Alliance Manager (see next section) echoed these sentiments:

> *"Their* [the IFs'] *enthusiasm and commitment to helping to make this work is palpable. They are happy to support those members who struggle to understand the process or don't get it. I think there comes a point when the team have got to fledge. They've got to get on and make their own mistakes and come back for guidance if they need it. And I think that's the stage we're at, at the moment I think."* (Alliance Manager: July 2015)

However, several Alliance Members commented on the novel status of the IPI Model and the fact that, while detailed guidance was available from the IF (who had developed the process), the detailed arrangements that would have enabled the Alliance to work quickly through parts of the process were not all in place:

> *"I think there is a point in time when you`ve got to start making headway…A more successful way of implementing IPI would be for the facilitators to have in place draft policies and guidance documents (e.g. draft procurement policy; draft risk and opportunities registers) to put in front on the table. The Alliance Board could then have restructured them if need be."* (Alliance Member: July 2015)

For their part, when interviewed, the IF representatives also recognized that they were occasionally leading the project:

> *"I`ve had to put more leadership in than I would have liked."* (IF:August 2015)

As project facilitators, they also sometimes felt frustration over what they perceived as slow progress and of a problem in adapting their more conventional approaches to what was needed under IPI. For example, commenting on cost planning work on Advance II, one Facilitator commented:

> *"They`ve ignored some of the advice we`ve given them as facilitators. For example, they have not reconciled the costs as they`ve gone along; didn`t really know where they were"* (IF: July 2017)

Clearly, the Facilitators needed to balance the need to give advice and guidance with the requirement to let the Alliance Members take control of the project themselves. The Facilitators continued to be integral to the functioning and development of the Alliance as it moved into Phase 2 and onto construction work on site. One challenge as the project progressed was to 'induct' new participants – for example, specialist sub-contractors – who had not been involved in the facilitated process up to that point, and did not always appreciate the requirements of close collaborative working under the IPI Model, and to remind them about what was required. The project FIRA commented in interview how he had observed that:

> *"The Facilitator is always on site, meeting with the team, the sub-contractors, and telling them how to do things. Telling them that if they have a problem issue, they should go and tell the team as everyone is working together on this project."* (FIRA: September 2017)

In addition to the facilitation role, the IF also had an important reporting function. Regular written reports (typically monthly) were provided to the client and, during the process of IPI Policy inception, and subsequently to the project insurers also. These provided a generally

qualitative commentary on the progress of the project overall and, in particular, on the IF's views of the collaborative performance of the Alliance, reported against the FUSION principles. These reports provide an important data source for the account of the project presented here, and also feature in the discussion of how participants on the project worked together – see Part 7: *Collaboration and Teamwork*.

Management and governance arrangements

Introduction

The IPI Procurement and Delivery Guidance (Integrated Project Initiatives, 2014) and the Alliance Contract outline the managerial and governance arrangements of a project being managed and delivered under the IPI Model. While these documents detail the key roles including the Alliance Board, the Alliance Manager, and Integrated Project Team (IPT), considerable work was needed by the Alliance in the early stages of the project to clarify and document how they wanted these different arrangements to work. This perhaps reinforces the point made earlier (under the *Role of the Independent Facilitator* above) that this trial of IPI on Advance II required further work on behalf of all involved to develop detailed processes that had not existed prior to the project. Certainly, it may be noted here that the organisational and governance work involved in the early stages of establishing the Alliance and mobilising the project consumed a significant amount of time (and therefore people resource costs). For example, the precise division of responsibilities between Alliance Manager and Project Coordinator were discussed at length at Board level, and were only finally resolved following meetings between the two individuals proposed for these roles. Similarly, the preferred content and layout of the monthly Alliance Board reports took time to be agreed upon by all. Such governance work consumed Alliance time and would not normally be experienced on a construction project where roles, reporting arrangements, etc would likely be more standardised and familiar to most, if not all participants. Of course, such arrangements on future IPI project should be easier because of the lessons learned on the Advance II project – Part 8 comments further on these and other 'lessons 'learned'. The different governance and management arrangements on Advance II are now detailed in turn.

Note that further commentary is provided on how these arrangements worked on Advance II in Part 7 below, under *Innovations…: Project organisation and management arrangements*.

Alliance Board

Following selection of successful bidders for the project, an Alliance Board was established to govern the Alliance. Formed of senior managers from each Alliance Member (including the client), together with an Alliance Manager, the Alliance Board is a necessary and essential organisational innovation under the IPI Model. The Board is required to provide overall leadership, direction and authority for the project and assume overall collective responsibility for decisions made. The Alliance Contract Annexes (an extract from which is presented in Appendix 6) details the duties of the Alliance Board at section 2.1. On Advance II the Board was supported by the IF who attended most Board meetings (see *Role of the IF* above). The Board believed this was essential as Advance II was the first trial of IPI on a UK construction project.

On Advance II, the Board was constituted with the help of the IF in early March 2015. Under the Alliance Contract the Board is an essential apparatus of project governance, and can agree to resolve difficult or divisive matters by vote. That said, decisions were generally reached by consensus and there were few matters that required formal voting – one such being the appointment of the Alliance Manager (see next section). A good deal of Board time in the early stages of the project was taken up with clarifying and establishing workable governance and organisational arrangements (instead of the more strategic matters envisaged in the role description in the Alliance Contract). This was understandable, of course, as detailed arrangements had yet to be developed for the IPI Model, and the process of working these out 'on the job' was something of a fresh experience for all participants. For example, the open discussion of likely people resource costs of each of the Alliance partners during Commercial Alignment and into Phase 1 (see below) had to be sensitively handled as no formal framework existed within which to do this and to allow the Alliance Members to build trusting relationships with each other. More detailed operational matters (i.e. contents and layout of Board reports; smoothness of technical communication with persons located remotely; time management at meetings) also took time to formalize and streamline.

The Board met generally at monthly intervals (more frequently at the beginning of the project), in principle to review and set the strategic direction for the project and to manage the achievement of all success criteria. Not surprisingly, as relations became established and the Board started to function as a group, residual governance issues were resolved quickly and efficiently. For example, in the early part of the summer 2015 the Board Members agreed to be flexible about meeting arrangements (in terms of meeting frequency, location and attendance) and also agreed to the participation of Alliance Member personnel in further IPI workshops (outlined above). Despite this, however, a common criticism of governance arrangements arising from interviews

with project participants was a lack of clarity between the Board and IPT roles, illustrated by the extent to which the Board tended to get involved from time to time in detailed matters rather than focusing on its more strategic remit (see below). As the IF commented,

> *"The amount of design detail that was brought into the Boardroom was unnecessary…The Board went into far too much detail and the meetings took too long."* (IF: November 2017)

Additionally, and in the early project stages, communication was not always clear between the Board, IPT and some of the Project Working Groups on Advance II. This was recognised by many involved as due to a lack of mutual understanding on roles resulting in potential overlap of responsibility and decision making. For example, early in the project, members of the IPT would often ask the Alliance Board for an update on project programme, whereas the Board saw programming and scheduling as an IPT matter. The issues here are not entirely to do with a lack of clarity about role descriptions. They seem more about the practical difficulties in adhering to them, and touch on matters of leadership (see above under the *Role of the IF*); the nature of the adoption of IPI on the project being the first such experience for all involved; and the extent to which the collaborative culture engendered on the project led perhaps to a lack of individual decision-making responsibility and urgency (see also under Part 7: *Collaboration and Teamwork*). Certainly, all participants felt, in retrospect, that Board Members could at times have taken a firmer, more decisive line on issues arising (or at least make it clear whose responsibility this was):

> *"Clearer definition of roles and responsibilities on the project would have been beneficial…it wasn`t just governance issues that held us up, but dealing with IPT work issues too"* (Alliance Board member)

> *"We could have had a stronger direction from the Board and more of a hands on approach in terms of how we should be operating as a virtual company. There was a disconnect between the Board and the IPT I felt… it could have been better, but it's not through any specific person's fault. I think it's just what you get if you put a load of people in a room that have never done something before and you've not got a proper plan."* (Information Manager)

The large number of issues typically on the agenda for Board meetings may have also impaired Members' ability to retain a focus at a more strategic level. One Alliance Board member commented that following creation of the Working groups, he expected his input to be confined to the monthly Board meetings, but that his input was required throughout. Additionally, while it is not possible to be definitive, it could be argued that Members, when confronted with the typical

pressures of design and construction, tended to focus more on the operational matters they could deal with rather than on the less familiar ones of how to achieve broadly-based success criteria. Nonetheless, the diversion of Board time to detailed design issues is an indication of where Alliance Board performance may be improved on future IPI projects (see Part 8).

An important lesson from this brief consideration of governance arrangements on Advance II is perhaps that the strategic focus of a project-based 'board' is difficult to distinguish from more operational matters, particularly when participants are working together in a collaborative environment and sharing day-to-day project challenges, approaching problem solving as a 'collective'. In this context, the question of 'leadership' of the Alliance Board needs to be considered, starting with the role of the Alliance Manager.

Alliance Manager

The Alliance Contract envisages an Alliance Manager, appointed by the Board, to provide day-to-day management of the Alliance, ensuring that decisions are made on a 'best-for-project' basis. On Advance II, shortly after the Alliance was formed (in March 2015) a candidate for Alliance Manager was identified from an organisation external to the Alliance that had a long established relationship with the client (MDA Consulting). The appointment was discussed among Alliance Members, the issue concerning what 'stake' an externally-appointed Alliance Manager could have in the project outcome given that the organisation was not contractually part of the Alliance and not party to the Gain/Pain Share Mechanism. The issue was resolved by a majority vote in favour of the appointment (one Member voting against). The Alliance Manager was confirmed in post at the firstAlliance Board meeting (early in March 2015) and took up duties and responsibilities as detailed in the Alliance Contract Annexes (section 2.2; see Appendix 6). Many of these Alliance Manager duties relate to working with the IPT. On Advance II, however, given the Manager's particular circumstances, the Board decided that the Project Coordinator (see below) should deal specifically with IPT matters. The split of duties between the two roles was:

- Alliance Manager: business management of the Alliance
- Project Coordinator: management of resources for design and (pre)construction as part of the IPT

The boundaries between both roles were not always easy to maintain, and the Alliance noting that Alliance management and project coordination were something of a 'joint' effort (noted in the minutes of Alliance Board meeting No.10, 11 August 2015). Alliance Members later commented in interview how defining and agreeing these leadership roles had taken time,

"*It's been a learning curve for everybody I think. We introduced a sort of entity called the Project Coordinator as part of the Lots and I think it's been interesting to see how that role integrates with the Alliance Board and the Alliance Manager. The Alliance Manager role is very spelt out, very specific in the contract. The Project Coordinator role is something that's been emerging really. I think if there's a lesson learned* [it's] *that I think we could have been a little bit more descriptive of what the scope of that role was."* (Alliance Member: July 2015)

The possible need for a more clearly defined Project Coordinator (PC) role was mentioned again by another interviewee in July 2015:

"There's a frustration and a lack of understanding about roles and responsibilities. It's taken a long while within the Alliance Board to pull together the roles and responsibilities for the key players… it would have been helpful to have just scheduled all that out at day one to say these are the responsibilities…who's going to take them on board? We would have a clearer understanding to publish to the IPI Team." (Alliance Member: July 2015)

Following appointment, the Alliance Manager coordinated the Alliance Board meetings and took on overall managerial responsibility for Alliance work. Additionally, the Alliance Manager also focused upon cost and financial management, working in close collaboration with the Alliance Cost managers (see below) on the project. The new managerial role required a unique combination of characteristics from the post-holder, as: a mediator of opinion; a manager of diverse professional input; a direct link to the client; an independent voice on a project with unique time and cost needs and pressures.

Project Coordinator

A Project Coordinator was appointed from Lot 4 (see Table 8 above) with overall responsibility for co-ordination of project activities, and general management, control and delivery of the project. This role was not clearly defined in the initial project documentation. As noted above in the discussion of the Alliance Manager, the role was defined by Alliance Members and distinguished from the Alliance Manger role, partly to ensure that the Board had a direct reporting and managerial line to the IPT via one of the Alliance Member organisations. It was later acknowledged by the IF that the Project Coordinator role would require clearer definition from the outset on future projects adopting this approach.

The Project Coordinator became an important link between the Alliance Board and the IPT, regularly attending meetings of both. As effective communication between Alliance Board and IPT took some time to become established, questions and issues of concern were often directed

towards the Project Coordinator, increasing the pressure and workload on that individual. Despite the role definition having been developed by the Alliance Board, there remained a degree of ambiguity about what the Project Coordinator did on a day-to-day basis for many participants unaccustomed to working in this kind of governance structure. An important departure from traditional approaches with the IPI Model is the absence of a Project Manager in favour of a collaborative Integrated Project Team (IPT). However, unfamiliarity with this feature of IPI led many participants to assume that the Project Coordinator's role is similar to that of a Project Manager. Others considered a lack of clarity around management and leadership roles more generally led to a lack of drive and action on Advance II:

> *"There's been a lack of people understanding what their role is, most of us thinking that it's somebody else who's doing something and they're not. So who is supposed to be leading the programme? And yeah, there's been a misunderstanding or a lack of clarity of who's supposed to be doing what which I think has led us down the line of wasting weeks because nobody has been driving it."* (Alliance Member)

For others, the unfamiliar terminology was more liberating, allowing discussions to be had about the roles and responsibilities necessary for the project that were free of links to more well-established roles, with the risk that participants might revert to roles that were deliberately designed out of the IPI Model:

> *"And they've got to break it, so using something that is not common, project coordinator, when you use the term they have nothing in their head because they don't really know what it means, and so therefore you can explain to them, which is a lot easier than trying to change somebody's perception."* (Alliance Member)

Integrated Project Team (IPT)

An Integrated Project Team (IPT) was established in the early phases of the project (March/April 2015); its roles and responsibilities being detailed in the Project Execution Plan (PEP; all as stipulated in the Alliance Contract – se Appendix 6). The IPT was composed of personnel from each Alliance Member organisation and was formed to lead design and delivery work for the project. Each Alliance partner identified 3 or 4 individuals to join the IPT, who then regularly attended IPT meetings. The only Alliance representative to sit on both Alliance Board and IPT was the Project Coordinator (the IPI Facilitators also attended IPT meetings frequently).

The IPT initially met bi-weekly, but meetings became more frequent as project Working Groups were established (see below). The IPT was the critical body for progressing all design, construction and fitting-out issues for Advance II; its functioning as a collaborative organ of

project management being vital to project development. Whilst both Alliance and IPT were constituted on collaborative lines, with the need for collective decision making reinforced continually by the Facilitators, adjusting to a more collaborative approach to decision making proved difficult for some members. One IPT member described a meeting when this was particularly apparent:

> *"We started trying to bite off too much really in a meeting with too many people. So it became a bit unwieldy I think. The project coordinator was meant to be guiding us through certain milestones, but, obviously it made it very hard with so many individuals and so many inputs. Everybody wants to make a good suggestion because it's the first one that's being done and they need to be, seen to be making suggestions. I think there was a lot of good suggestions but there wasn't many decisions made. I think decision making is paramount because there's a chain isn't there that you've got to make certain decisions to be able to then enable other decisions to be made."* (IPT Member)

The IPT settled into two types of meetings: Progress Report meetings and 3D Model Review meetings. IPT Progress Report meetings usually followed a set agenda:

- A review of previous meeting notes
- Programme/Milestones review & Strategic Brief Update
- Planning Work
- Design Development & Coordination (different Work Group discussions: Envelope; Structure; Utilities/Drainage, etc.).
- Target Cost Planning Update
- Opportunities/Risk Managament
- Action Points

IPT Progress Report meetings enabled various project Working Groups to report back to the larger IPT with work progress and issues of note. Progress Report meetings included reviews of Opportunities and Risks identified on the project (see also under *Defining the Target Outturn Cost – Phase 1* below) and how they were being managed and controlled.

The 3D Model Review Meetings brought the IPT team together to focus on the evolving digital model of the Advance II building. Successive iterations of the 3D model could be produced for the IPT to review because of the Information Delivery Cycle established by the BIM Manager on the project (see Part 7: *The adoption of BIM*). The 3D Model Review meetings were seen by participants as having a very positive impact of design development, facilitating collaborative and focused team discussions on many different design and construction aspects of the planned

building. Despite this, the lack of clarity between the roles of the IPT and Alliance Board (see above) remained an issue during Phase 1 in particular:

> *"We had a project coordinator initially running the IPT and then bringing in communication from the IPT to the Board. The Board always went into far too much detail and didn't operate as a Board, they tried to manage the project."* (IPT Member)

While IPT members generally worked together throughout Phase 1 (see under Part 7: *Collaboration and teamwork* below) , from time to time reports to the Board were produced by individual IPT members then presented as IPT documents, though the IPT collectively did not always input to them. One Alliance member commented:

> *"A Quantity Surveyor owned the cost plan; a Contracts Manager owned the programme and they pulled together reports and then people got a peripheral look at them, rather than them being owned by the IPT which obviously means that people took a different stance on some of the content."* (IPT Member)

While such practices were not endemic, they were acknowledged by most participants as an occasional tendency among them to revert to more familiar modes of working, especially when operating under time pressure. They were also recognised by the IF who worked continually to remind participants of their ongoing obligations for collaborative working, encouraging them to ensure that they worked together on all key aspects of design development, costing and reporting.

Alliance Cost Managers

Cost management

Alliance Cost Managers were appointed with primary responsibility for cost planning and to maintain the accounts and financial records of the Alliance. The duties of the Cost Managers are detailed in the Alliance Contract Annex (see Appendix 6). On Advance II, two individuals were appointed to this role in May 2015 from different Alliance Member organisations: a Building Estimator from the Constructor and a Building Services Estimator from the specialist M&E contractors. This joint appointment was made as the Alliance acknowledged that different skills, knowledge and data would be needed for the building and engineering aspects of the project. The Cost Managers together formed the Advance II Cost Planning Sub Group, tasked with collating, reviewing and updating the evolving project cost spreadsheets with the latest design data from Alliance partners.

The work of the Cost Managers was challenging on Advance II as the project demanded a different approach towards cost planning in particular. The overall aim to achieve savings against the Investment Target and, if possible, against the Target Outturn Cost meant that project costs

needed to be continually challenged and questioned. This required an understanding – in advance of obtaining quotes from specialist installers and contractors, for example – of the likely order of costs for key building elements and components. This was not a process familiar to those involved, who also needed to work closely and collaboratively with the Integrated Project Team (IPT) continually refining forecast costs through what is called Opportunities and Risks management.

Opportunities and Risks management

Embedded in the IPI model is the concept of managing opportunities and risks. The thinking underlying the IPI Guidance (Integrated Project Initiatives, 2014) is that a focus on 'lowest cost' through the procurement, design and delivery stages of construction projects often causes undue focus on driving down *prices* without due regard for the impact on overall project outcomes and the long term value to the client as well as subsequent users and owners. By contrast, IPI tries to focus more on improving *value for money*. The argument is that value may be improved by taking account both of opportunities (e.g. from innovative design solutions, prefabrication options and improved site installation techniques) and risks in an explicit and balanced way. It is argued further that a premium for risk, for example, is typically present in supplier pricing – for both services and products – to guard against uncertainty and the potential difficulties of working with others on construction projects. These premiums may either be implicit in pricing or made more explicit through the addition of 'contingency' amounts. The IPI Model, with its focus on collaborative working and joint ownership of project risk and reward is expected to remove many, if not all, of these premiums and contingencies.

Opportunities and Risks is an integral part of cost management but involves all the Alliance in a search for improved value by focusing explicitly on exploiting valuable opportunities and reducing and, where possible, avoiding the risks involved. Alongside the project cost plan is an Opportunities and Risks register which is owned by the Alliance, but led from time to time by Members who can significantly contribute to it (e.g. from the project/BIM coordinator when it was time to tie down competing technical options; from Working Groups – see below – that identified potentially valuable design and construction solutions; from the IF when traditional cultures challenged the positive attitudes and exposed the Alliance to increased risk). As will be seen, it took some time for the Alliance Members and Cost Managers to get to grips with this process, and it remained a challenging (though valuable) process through Phases 1 and 2 – see further below under *Developing the Target Outturn Cost – Phase 1: Early cost planning and the Investment Target*. Note also that the TIRA and FIRA, by providing independent commentary on risk in particular, provided valuable input to the Opportunities and Risk process.

Project Working Groups

As design work progressed, the IPT established a number of Working Groups to focus on different elements and aspects of Advance II (e.g. Roof; Lift; Envelope/Frame). Working Groups were formed covering the following:

- Frame
- Envelope
- External Works
- Lifts
- Thermal Modelling
- FF&E
- BIM
- Soft Landings.

Working Groups were encouraged by the Alliance to take ownerships of particular work packages/tasks and were intended to have considerable freedom for design and other development activity. The separate Working Groups reported directly to the IPT, with the IPT in turn reporting to the Alliance Board, usually via the Project Co-ordinator (the one individual who regularly attended both Board and IPT meetings). It took time for the Alliance to agree on an Advance II Working-group structure and for the Working-groups to build up momentum and develop collaborative working relationships between the participants involved:

> *"The working-group structure is something that is quite a common way of dealing with all the various aspects of the project. Prior to that people were a bit unclear of what they were doing, when and for whom. My only observation is that it's still bedding down. I think it's getting there but those sort of groups were put in place three weeks ago. It is very, very early days but the logic is sound."* (Alliance Member: July 2015)

The Working Groups met periodically through Phase 1 to work on their delegated areas of interest, being given room to develop the design and report back to the IPT and Project Coordinator. The Working Groups were generally multidisciplinary in nature, including suppliers (and potential suppliers) where available.

Trinities

Although a range of separate Working Groups were established to develop the design through Phase 1, discussions at IPT meetings revealed differences in how these Groups operated, especially when commercial, design and delivery issues needed consideration and resolution. For example, whilst some Groups approached suppliers with open invitations to obtain a price for the

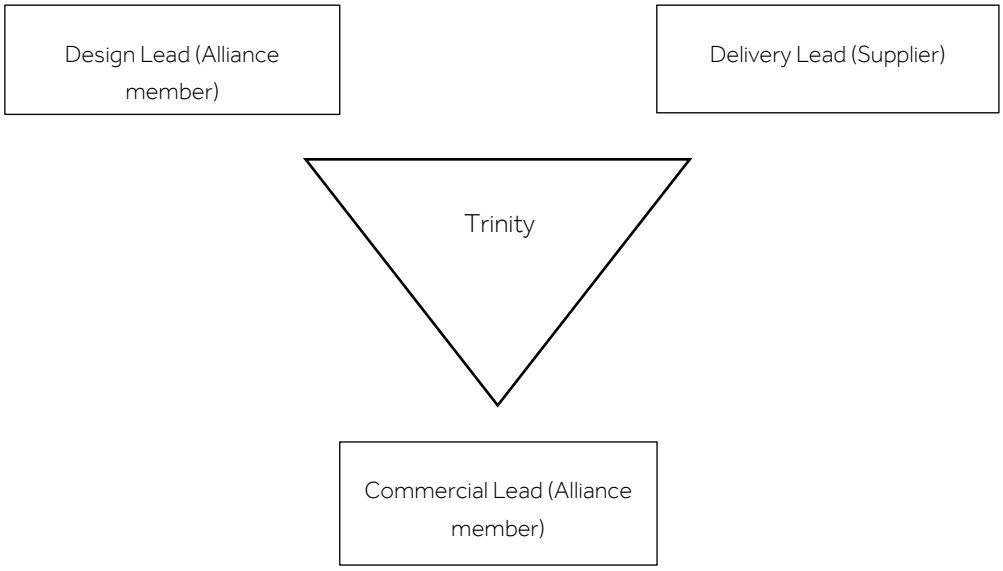
work and/or services, others were clearer in stating that risk should not be factored into supplier pricing (i.e. a general risk premium should not be priced in a project that is collaborative where all parties share risk and reward). Partly because of these inconsistencies, and partly in recognition of the importance of the 'trinity' of requirements relating to design, delivery and cost that needed to be kept in balance, the Alliance developed a new structure for the development of work packages. Called 'Trinities', these ensured that consideration of commercial, design and delivery issues should be more explicit and consistent across the project (see Figure 6).

The Trinity innovation (initiated following an IPT discussion in early 2016) evolved from the original Working Groups structures. From that point, each Working Group took the form of a Trinity being composed of a Design Leader, Delivery Leader and Commercial Manager (and a supplier representative when appropriate).

Whilst the Trinity innovation was initially positively received by all Alliance partners, some Alliance Members felt in retrospect that it was not fully exploited. This was mainly because the IPT personnel involved were often under pressure to meet work package design and procurement deadlines and tended to revert to more conventional ways of working, not always ensuring that the 'trinity' of design, commercial and delivery requirements were kept in balance:

> *"For me the Trinity was a great concept that wasn't properly implemented or followed, which again caused us issues down the line because that close knit collaboration really wasn't there."* (Information Manager, November 2017)

Figure 6: Trinity Structure for Project Work Packages



Source: IPInitiatives ©

Comment

Working Groups and Trinities, once established, became a generally effective means of developing the design and ensuring that important aspects of cost and delivery were kept in view. However, some groups became established early on the project and progressed quickly (e.g. Lift Working Group) while others took longer to achieve clarity around their particular task and develop good working relations between the participants involved. The IF commented on the challenge of establishing functioning working groups quickly on a collaborative project:

> *"I think it has been difficult getting clarity on who is doing what. I think it is a step up for the Alliance Cost Managers as it is new to them. And I think it was a huge step to agree a* [number] *of working-groups, and actually set people with responsibilities for their working-groups. And now, I'm quite comfortable that the project is well organised."* (IF: August 2015)

Difficulties around clarity of objectives may be rooted in the challenges faced by the Alliance and IPT in resolving their respective roles (see above), as well as in the Alliance's desire to encourage Working Groups to take a good deal of ownership of their particular work packages and tasks. This may also reflect a lack of project leadership and drive noted by many participants, and touches on a core challenge encountered on Advance II: the need to foster collaboration and empower participants to contribute effectively whilst ensuring firm and decisive leadership is in place to push forward project work. This issue is returned to in Part 8.

In the context of the project overall, the challenge of developing and implementing a range of new governance and management structures needs to be viewed alongside other significant challenges on Advance II of adopting a novel IPI Model while at the same time striving to achieve significant cost and time savings. An Alliance Member commented:

> *"Because there is a complete absence of any* [prior] *structure … it has been very, very difficult to make any headway. I think the way IPI is being trialled has a flaw in that you're asking too much of the participants. We're being asked to take on board a completely new procurement method with completely new structures in terms of procurement, contract, insurance and we've been given some very tough targets, challenging targets in terms of saving 20% in cost and waste in programme, and on top of that we're being asked to design the structure by which we do all of that, and I personally think that that is an unrealistic requirement."* (Alliance Member: July 2015)

The process of commercial alignment

Introduction

In the IPI Model, Commercial Alignment is undertaken immediately following the selection of the Alliance Members and execution of the Alliance Contract. It involves the Alliance Members, facilitated by the IF, reaching an agreement under which:

- each Member undertakes to deliver its part of the project within the 'not to exceed' value specified for its Lot during the selection process, and
- the Members jointly undertake to deliver the project in accordance with the strategic brief at a cost (the 'initial target cost estimate') which is within the Client's investment target.

If the parties fail to reach Commercial Alignment, the Client may exclude any 'non-aligned' Partner from the Alliance, or indeed terminate the contract.

More specifically, the process involves agreement on how the commercial principles in the Commercial Model for delivering the project will operate. The basis of the Commercial Model is explained in Part 6 below, and further details are provided in Appendix 5. In summary terms, the Model provides for reimbursement of project costs in terms of:

- The Defined Cost (comprising direct costs [ie the costs of people and equipment] and project specific overheads, including site costs)
- Alliance Member company overheads and profit
- Suppliers' costs.

The Model also includes an incentive scheme (the Gain/Pain Share mechanism) to help ensure that costs incurred are less than the target.

During Commercial Alignment the Alliance Members agree on:

- the components making up the Defined Cost
- the people who will work on the project
- each Member's corporate overhead and profit percentages, and how their proportions of the total sum of corporate overhead and profit will be allocated
- the parameters of the incentive (Gain/Pain Share) scheme
- other matters, including:
    - other sums required but not included in the standard breakdowns provided in the Contract Annex for the Commercial Model, and how these will be paid
    - arrangements for the operation of the Project Bank Account.

Ideally, the Members should also produce a budget for Phase 1 of the project under the IPI Model (it may be recalled, from Part 2 above, that Phase 1 involves the development of a viable and affordable project solution together with a Target Outturn Cost prior to submitting the project for IPI Policy inception – see also Part 6). Commercial Alignment is very important as it determines how Members are paid and, in particular, how they share in the corporate overhead and profit element of project costs. Under the IPI Model Alliance Members are reimbursed for costs they incur (and control). The particular focus is on reducing Defined Costs – and indeed, the Alliance is incentivised to do this, but these costs can of course increase – while at the same time 'protecting' the total amount of Members' overheads and profit (this is called the Ring Fenced Sum and is fixed in relation to the Target Outturn Cost). Part 6 provides further details on the operation of the Commercial Model.

During Commercial Alignment, therefore, the emphasis is on agreeing Members' overhead and profit percentages and arrangements submitted during the bid stage. These will eventually help determine the Ring-Fenced Sum and also how Members will be reimbursed for overheads and profit during later stages of the project. Note that overhead and profit for Phase 1 is paid retrospectively at the end of that Phase. Agreement on the specific personnel to be involved in the 'lean team' for the project is also an important outcome of Commercial Alignment, as is a commitment to deliver the project in accordance with the strategic brief and for the 'initial target cost estimate'. While the broad 'parameters' of the incentive scheme are also agreed at this time, the precise details of Members' shares in risk and reward (Gain/Pain) are not agreed until the end of Phase 1.

Commercial Alignment on Advance II

On Advance II, the process of Commercial Alignment commenced immediately following confirmation of the selection of Alliance Partners (see above in this Part, under *Procuring the Integrated Team*) at the end of February 2015. An Alliance Board was formed (see above under *Management and Governance Arrangements*) and set quickly about the task of setting up the project, agreeing roles and responsibilities and confirming management and governance arrangements. Although the Alliance Contract was not formally executed until May 2015 – due mainly to delays in client-side conformance requirements – many of the Alliance Members signed the contract on behalf of their companies once the Alliance Board was constituted, and others (including the client) signalled their intention to do so. Commercial Alignment formally started upon Alliance Contract signature by the Alliance Partners.

Four meetings of the Alliance Board (one each week) were held in the month of March, chaired by the client and supported by the IF, and a good deal of time was spent familiarising Members

with the new IPI Model and procedures. Commercial Alignment was also a key priority in these early meetings. As the Contract required Commercial Alignment to be achieved within 30 days of contract signature, the IF set an initial deadline of 31 March. All Alliance Members (including the client) were keen to progress to Phase 1 as quickly as possible so that design development could begin in earnest and the project submitted for Local Authority planning approval. Commercial Alignment focused mainly on the agreement of overhead and profit percentages for the Alliance Members and, to a lesser extent, how their respective allocations of the Ring-Fenced Sum would be paid. There was also considerable discussion of how the Commercial Model would work, with Members interested in developing an improved understanding of the client's investment target (identified as £10m-£12m in the PQQ).

By the second Alliance Board meeting (on 10 March 2015) the Members raised the idea that all could adopt equal shares of risk and reward in the incentive scheme, reflecting perhaps the strong collaborative environment that was being created (see further in Part 7: *Collaboration and Teamwork* below) as well as the commitment of Members to the project. These shares were not agreed as part of Commercial Alignment but finalised later in Phase 1 (see Part 6). By the third meeting on 16 March progress had been made on defining the components of Defined Cost, including the key personnel to be allocated to the project. Initial budgetary estimates for Phase 1 costs were also discussed. Some Members required clarification of what, under the IPI Model, qualifies as overhead and profit (eg travelling and subsistence expenses, staff vehicles, etc) so that percentages (oncosts) could be refined.

Commercial alignment was reached at the fourth Alliance Board Meeting on 24 March. As in the third meeting, a good deal of discussion was around the rationale for how the ring fence sum was to be allocated. The actual sum was not defined until the end of Phase 1 but the share allocation was agreed during commercial alignment. Precise details of the overhead and profit percentages for each of the Alliance Members are commercially confidential, though it may be noted that these varied from 60% of the 'people costs' element of Members' Defined Costs to 128%. Additionally, the Alliance Members discussed how their respective allocations of the Ring Fenced Sum would be paid, though this was not formally agreed and incorporated into the Contract until Phase 1. Members also scrutinised proposals for the allocation of roles and associated people costs for Phase 1.

Participants views of the Commercial Alignment process

While the thinking behind a short (30 day) commercial alignment process was to move quickly into design development in Phase 1 – and this was achieved on Advance II – those involved in the project generally felt that Commercial Alignment was too rapid, leaving some important issues unresolved. Key issues here included the budget for Phase 1 and how overhead and profit would be allocated among the parties and, while these were concluded in Phase 1, participants reflected afterwards that more time was needed during Commercial Alignment to establish Phase 1 on a firmer commercial footing. Why the period was not extended at the time may be partly explained by a strong desire among Alliance Members to retain early momentum and to press on towards a planning submission in particular.

> *"And coming out of commercial alignment too early, people felt pressurised to agree things … that they didn't need to agree. We hadn't done any design and they* [the client] *were panicking about planning. … Commercial alignment's too short, all we did was share on the basis of our OH and P, single ratio figure in the bid, the only bit of commercial information in the bid was this single ratio figure.* …[We] *should not come out of commercial alignment until we have absolutely, at the minimum, agreed what the first order of the Phase 1 and 2 cost is, yeah, or [at least] the people cost."* (Project Coordinator)

> *"…all of us around the table during the commercial alignment stage, we weren't fully aware of the fact that it was a bit of a moving target really. It was a best guess at an early stage and we put a lot of effort into it. We reached commercial alignment but the truth is that, despite the fact that we had reached commercial alignment, the only figure that is still cast in stone is the OH&P figure that we all inserted in our ITT submissions."* (Constructor)

> *"And that we ought to have not come out of commercial alignment until we had a set of benchmark data that we were all comfortable with. And if that meant going out and buying a resource to provide it, we should've done that."* (Lessons Learned Workshop Participant, August 2017)

The IPI Guidance and the Alliance Contract have since been revised to require a 60-day Commercial Alignment period on future projects rather than the 30 days targeted on Advance II. It may be noted also that the Alliance had a lot to consider in the early weeks following the selection of Partners, not least in coming to terms with a very unfamiliar (IPI) process, new management and governance arrangements, unusual terminology, and of course potential Partners whom they did not know. Indeed, a good deal of time at the early Alliance Board meetings during March 2015 was given over to discussion and clarification of the detail of IPI procedures and the operation of the Commercial Model, as well as getting to know each other.

> *"I would do commercial alignment differently, we've already changed the contract to reflect some of that, and I think because commercial alignment forces people … to agree the initial resources sitting behind the ring fenced sum and the contract sum, but actually they don't know each other well enough to know who's best suited to* [different roles]*."* (IF)

Speaking further about the allocation of management roles and responsibilities in the early stages of the process – and the appointment of the Alliance Manager in particular (see also Part 5) – the IF reflected on the need for Alliance Members not to allow the pressures of Commercial Alignment to rush key appointments:

> *… I would just allocate some of the people and the ring fence sum outside of any belonging to a business, take a high average of the three on offer, and say right, so let's not make haste, let's not make some decisions too quickly. …I think making decisions too soon, which the commercial alignment does force you into because you sign the contract and you're in commercial alignments straight away, I think it's hard, very hard."* (IF)

Defining the Target Outturn Cost – Phase 1

Introduction – cost management under the IPI Model

Features of the IPI Model

The management of project cost under the IPI Model has a number of differences from more conventional approaches. It is important to distinguish two main targets:

- The Investment Target, which is the total anticipated project expenditure for achieving the requirements of the strategic brief and includes all project associated costs. These could, for example, include the cost of land, taxes, fit out and furnishing costs, as well as design and construction costs.
- The Target Outturn Cost, which covers design and construction costs and forms the target against which the Alliance is incentivised (see also Part 6).

The Investment Target

The Investment Target is be set initially by the client as the affordable budget for the project as a whole and is validated by the Client Advisory Team at the outset to ensure that the project is deliverable within it. In Phase 1 of the IPI Model the Alliance Board develops a Target Cost which it hopes will be insurable under the cost overrun provisions of the IPI Policy. This should be a challenging target, i.e. a reduction against 'business as usual' (what could typically be achieved in the current market) and should be broken down into an elemental cost plan. The

Members then identify 'opportunities' for achieving or bettering this reduction in each of the elements – this might include consideration of alternative materials, different methods of implementation or omitting costly processes like specification writing. The Alliance considers the likelihood of achieving these opportunities together with the more traditional risks associated with design and construction, adopting what is called an 'Opportunities and Risks' approach. This involves estimating the likely (risk free) cost of each of the project elements, identifying the opportunities available to achieve it (as potential cost savings) and the associated risks (as potential additional costs). The target cost becomes the aggregate of the three (with the savings from opportunities subtracted). The Alliance then evaluates both opportunities and risks through the process of design development and, when Members (and the Financial Independent Risk Assurer (FIRA) are satisfied that the costs, opportunities and risks are realistic and achievable, the target cost becomes the Target Outturn Cost and the project is ready to be presented for insurance (Policy Inception).

The Target Outturn Cost

The Target Outturn Cost is essentially that part of the total investment required that is under the control of the Alliance. It is highly significant in the IPI Model as it is incorporated as the key financial target in the Alliance Contract, effectively defining cost overrun. It thus governs the extent to which Alliance members share in risk or reward (via the Gain/Pain Mechanism) as well as how the cost overrun element of the IPI Policy operates, should the Pain Share limit (essentially the IPI policy excess) be exceeded – Part 6 provides further details.

Under the IPI Model, the Target Outturn Cost is not formally agreed until near the conclusion of Phase 1, when the project is submitted for IPI Policy inception. However, an initial target cost estimate may be produced either during Commercial Alignment to assist the Alliance in alignment activities, or early in Phase 1 (see under *The Investment Target* above) to help direct the Alliance towards establishing the Target Outturn Cost. Such an initial target cost estimate may also be used to help validate the client's investment target as well as to establish a budget for Members' work during Phase 1 (see under *The Process of Commercial Alignment above*).

The basis of any initial target cost estimate is the information available to the Alliance in the early project stages as well as historic cost information from the Members' previous experience of projects of a similar nature and complexity. This is the 'business as usual' performance noted above, and the idea is that the Alliance works progressively through design development to develop a more challenging target that will deliver significant benefit compared to 'business as usual'. This more challenging target, when agreed, is the Target Outturn Cost and is considered

as ‘Best Practice’ performance that provides value for money for the client. Issues for consideration in preparing the Target Outturn Cost should include:

- Information the Alliance has developed from the initial strategic brief
- The opportunities and risks considered and included or rejected
- The design and construction innovations included, and the plan for implementation
- The extent of Phase 3 activities (post-completion; see Part 2 above) and any reserve required to fund them.

Once the Target Outturn Cost is agreed, the total amount of company overhead and profit cost (the Ring-Fenced Sum – see Part 6) for which the IPT will be reimbursed is also fixed.

During the development of the Target Outturn Cost, the Alliance Members may be advised by the FIRA on the verification of the initial target cost estimate so that the opportunities and risks included are clear and understood.

Developing the Target Outturn Cost on Advance II – Phase 1

Initial developments – the Investment Target

The development of the Target Outturn Cost and the Cost Planning process adopted on Advance II is described in the accompanying InnovateUK research report *Work Package 22 – Process of updating the Cost Plan* (University of Reading). This was produced in March 2016, following the conclusion of Phase 1, and covers the early stages up to the end of that Phase. An additional report also covers the development of the project design during Phase 1: *Work Package 20: Rationale of product selection: whether criteria of whole life costing, sustainability, etc. are being applied* (University of Reading).

During Commercial Alignment, the Alliance Members interrogated the client’s Investment Target (identified as £10m-£12m in the PQQ) in an attempt to get greater clarity. An early investment appraisal, undertaken by the client’s cost advisor (MDA Consulting) prepared during the selection of Alliance Partners at the end of 2014 was made available in March 2015 and this identified a total investment requirement of some £11.685m (including land costs and ‘post occupancy expenditure’ of some £1.23m). This became a *de facto* Investment Target that, as will be seen, was confirmed as the Investment Target throughout the project. However, while the appraisal included sums for design, construction and other costs, it was not possible at this stage to identify the potential amounts that would come under the direct control of the Alliance, and no separate estimate of the Target Outturn Cost was provided.

The £11.685 million target was derived from the outturn cost of the Dudley College Advance I project (see Part 4 above) which was initially used as a benchmark against which Advance II

could be compared. The initial expectation for Advance II was that it could be delivered at some 15%-20% below the declared Investment Target if the benefits of improved collaboration and increased efficiency of working under the IPI Model could be exploited. However, it was later queried by Alliance Members (see below) whether this level of saving should have been directed at the Target Outturn Cost (which had yet to be defined, but which the Alliance could control) rather than at the Investment Target, which contained amounts (eg for Land, taxes and other issues) that are outside of Alliance control. Further, the comparison with Advance I was not particularly precise, and Alliance Members and the IF were conscious that possible specification and acommodation differences between schemes I and II, as well as other variables (inlcuding inflation in the intervening period) could affect a 'like-for-like' comparison. Nonetheless, while a detailed benchmarking comparison was not carried out, Alliance Members felt that the close similarities between the two Advance projects (i.e. the same client and stakeholder interests; similar geographical location, building scope and overall construction standards) provided a sufficiently useful starting point for the development of the Investment Target on Advance II.

Phase 1 – early Cost Planning and the Investment Target

The delay in commencing Phase 1 following Commercial Alignment has been noted above and in Part 4 also. On commencing Phase 1 in May 2015 the Alliance Members focused a good deal of attention on understanding what needed to be provided for the Investment Target and what could be afforded within it. At the same time they were starting to develop outline design solutions as part of design development for Local Authority Planning approval. The early design development and cost planning process is described in some detail in the companion report in the series available on this InnovateUK project: *Work Package 22 - Process of updating the Cost Plan* (University of Reading; March 2016), and a brief summary is presented below.

The Alliance Board appointed a Cost Manager (as required by the Alliance Contract), selecting two estimators to the role to work jointly: one from the contractor and another from the building services specialist contractor. A Cost Planning Sub Group called the Target Cost Group (see above under Management and Governance Arrangements), including the Alliance Manager, was formed to oversee the development of the project Cost Plan. This Group provided regular cost planning updates to the IPT and Alliance Board for review throughout Phase 1. Other Alliance Working Groups (e.g. structural frame; envelope – see above) regularly provided input to the Target Cost team for pricing, amounts being continually reviewed and revised in the light of design development. These arrangements remained throughout Phase 1 of the project, including when cost planning work became intense (late 2015) as the Alliance prepared and submitted

planning applications and as more refined cost forecasts were required in order to confirm the Target Outturn Cost for IPI Policy inception.

Phase 1 of the IPI Model essentially involves a period of design development within which the Alliance Members work closely together to develop design solutions that offer the potential to meet or exceed the success criteria at a cost lower than the Investment Target. It is an interative process of proposal, assessment and counter proposal, and it is to be expected that initial estimates of cost may fluctuate considerably during this period. In the early months of Phase 1 (Summer 2015), however, the IPT members of the Alliance believed that the Investment Target was too low and should, in addition to reflecting the outturn costs of Advance I, contain provisions for cost inflation covering the period since Advance I completion, and also for possible enhancements in specification and accommodation between the two schemes. Conversely, the IF – who helped facilitate Alliance Board Meetings and meetings of the IPT and Target Cost Group – believed that the Alliance's initial estimates of overall cost were too high, and did not take account of the potential for waste reduction and saving that the IPI Model offered. This tension is an anticipated by-product of the need to agree a Target Outturn Cost that is both challenging and at the same time provides an opportunity for the Alliance to reduce it (see Figure 1, Part 2).

However, uncertainty over what constituted the initial estimate of the Investment Target was a key feature of Alliance discusions on cost in the early months of Phase 1 (May to July 2015), with Members being unclear on the status of land cost and taxes:

> *"I think one of the key issues around the investment target is it's been difficult to understand at the earlier stage because we didn't know whether it included or excluded VAT, how it related to the land value wasn't that clear. And then more recently we've got the added complication of the sports pitch being an issue…So it's a bit of a moving target. I think it's OK, as long there's clarity on what you're starting from and then you decide what the 20% relates to, because the 20% can't relate to the site cost necessarily."*
> (Alliance Board member: July 2015)

Additionally, a consistent format for the presentation of the Cost Plan had not yet been developed - while some versions attempted to separate those items not under Alliance Control (eg land costs, Fixtures and Fittings, and VAT) from the Investment Target in a consistent way, other versions did not always follow this convention and this did not help clarify the more detailed content of the Investment Target at this stage. These uncertainties continued until late in Phase 1, and did not help what could, in retrospect, have been a more effective design development and cost plannning phase had the Alliance been more clearly focused on a target cost from earlier in the process – see further below and under *Concluding Phase 1*).

During June to September July 2015 the Alliance, supported by the Target Cost Group and the IF worked through design development and cost planning using the Opportunities and Risks approach, identifying initial forecast costs that were considerably in excess of the Investment Target of £11.685m. The table in Appendix 4 charts the development of the Cost Plan against the initial Investment Target from June 2015 through to the amounts finally agreed for Policy Inception in January 2016. Differences were due partly to the more detailed cost breakdowns adopted compared to the original high level summary provided for the initial Investment Target. While an additional provision was made for clients 'Fixtures and Fitting Out' (which would ultimately be outside of the Target Outturn Cost) as part of these estimates, the totals for 'Co-ordination and Fees' (essentially Alliance Members' people costs and overheads/profit necessary for design and construction) and for construction fluctuated as the Alliance came to terms with the likely amounts required as the design was developed – see *Work Package 22 - Process of updating the Cost Plan*.

From September 2015 onwards, Design and Cost Planning meetings became more frequent and intense, with Alliance Members and the IF in particular becoming concerned that the total forecast cost remained significantly higher than the Investment Target. A good deal of this was due to the higher provision made for Fixtures and Fitting Out and, during September, the clarification of VAT treatment for all Alliance Members which more than doubled the original VAT provision. However, when account is taken of these changes the amounts for fees and construction cost remained as high or higher than the initial provision in the Investment Target, and during October the Alliance focused more on the potential for reductions to help meet the initial 15% -20% reduction target. The IF believed that, instead of working 'top down' from the Investment Target to establish what is affordable, the Target Cost Group and the Alliance were adopting a more traditional 'bottom up' approach of identifying the more detailed elements required and assessing the likely cost of providing them. This, he felt, led them to include higher provisions for risk and uncertainty than they should be making under the IPI Model. He argued, for example, that sub-contractors' initial estimates for elements of work included in the Cost Plan by the Target Cost Group had amounts for risk and inefficiency 'built-in'. As these subcontractors had not yet been engaged to work in the IPI Model, the IF maintained that they were estimating and pricing in a conventional way, making more allowance for risk than they needed to – and that their prices also contained waste/inefficiency that would be removed under the IPI Model. Nonetheless, some Alliance Members were unconvinced that a 15%-20% reduction was achievable, regardless of whether IPI was used or not:

"I personally think the 20% savings are ambitious. I am here to be proved wrong but I think that's optimistic. I think it's a figure that maybe 20 years ago, even as recently as 10/15 years ago in certain sectors, certain markets, the industry potentially was awash with cash that led to inefficiencies or areas that could be done more efficiently… I think a lot of the waste, the surplus, overpricing have been reduced quite dramatically. My gut feeling and the feeling of our company is that the target of the 20% is a very optimistic figure." (Alliance Board member: July 2015)

The client representative also reflected upon the target 15%-20% savings on cost:

"I would be personally happy if we manage to achieve 5%. I think a lot of it will be based on how you would measure what is an actual saving over what we would have traditionally had to pay. I've still got to be convinced that there's a way of measuring that with any degree of universally accepted certainty." (Client representative: July 2015)

The Alliance and the IF had, in any event, been reducing their expectations of potential savings to more like 10%, which was to be reduced further, as the Cost Manager commented:

"We initially sort of followed the 10% reduction but then had further discussions and it was agreed that was a little unrealistic. We then spoke to our procurement manager and looked at 3 or 4 example jobs and we actually looked at the amount of buy-down that he was able to achieve with various trades. So from that we got an average reduction for each trade and we actually applied those reductions to the cost plan." (Alliance Cost Manger, October 2015)

During October and into November 2015 as the design became more developed the Alliance became progressively more confident in identifying the people cost and overhead/profit elements of their costs. An 'Opportunities and Risk' workshop (see above) in October brought Alliance Members together to identify where cost gains could still be made on the project (e.g. through "better use of BIM"; "clearer communication of programme schedule by whole Alliance so time gains may be made"; "incentivisation of trade partners"; "streamlining activities"). Progressively, in this period, the amounts included for risk were reduced, from £1.48m in early October to some £0.79m by late November – see Appendix 4. A particular focus of design development and cost planning at this stage was on reducing the costs of the structural frame and cladding (see *Work Package 22 - Process of updating the Cost Plan*). By the end of November, the total forecast cost (at some £12.46m) was within 7% of the intial Investment Target.

Concluding Phase 1 – confirming the Target Outturn Cost

The later stages of design development and cost planning in Phase 1, ie from November 2015 through to mid-January 2016 focused on agreeing a scope of work and Target Outturn Cost that could be submitted for IPI Policy Inception. As part of this process, Alliance Members also agreed their respective shares in the risk/reward incentivisation scheme (the Gain/Pain Share Mechanism – see Part 6 below).

The cost plan of 16 December (see Table, Appendix 4), produced to support the initial submission to insurers for Policy Inception (see Part 6), is the first to identity specifically the Target Outturn Cost, at some £9.991m. It is also the first to show the overall forecast cost at the level of the investment target of £11.685m. Savings over the previous version of the cost plan were achieved by:

- Reduction in the costs of roof, external walls, and floor/ceiling/wall finishes elements - these all show reductions in the cost plans from late November to early December, resulting from detailed discussions with suppliers that identified design modifications and reductions in quantities of materials and work.
- A deduction for work included in the initial Investment Target to divert underground drainage across the Advance II site which was paid for by the client under a separate contract.
- A deduction in the 'Fixtures and Fitting Out' provision – but note that, at some £1.25m, the amount is some £0.35m *above* that in the initial Investment Target. Note also that the final VAT amount (at some £0.52) is *over double* the provision in the Investment Target.

While the total amount for 'Fees' had increased slightly, the proportion of People Costs to the Ring Fenced Sum (60:40) had been more or less reversed from the earlier position in November (35:65), reflecting a greater level of confidence than before that Alliance Members understood the level of People Costs required for Phase 2 – see Table, Appendix 4. The risk provision in the Target Outturn Cost was also lower than most previous estimates and, at £0.55m was some 5.5% of the Target.

The amounts in the cost plan used for Policy Inception are not directly comparable with the costs in the initial Investment Target. However, it may be noted that, when set alongside the initial Investment Target, the final cost plan forecast of £11.685m includes a net *additional provision* (excluding the amount for drainage works) of some £0.49m for Fixtures and Ftting Out work, land and additional VAT. This comes comes mainly from reductions in construction cost and is equivalent to a 'saving' of some 5% on the combined fees/construction costs included in the initial Investment Target.

An initial report by the FIRA (appointed in October 2015) to the client in November provided a qualitative commentary, confirming the adequacy of cost planning and cost benchmarking on Advance II, and that no significant risk items were identified. Shortly following the submission of the project for Policy Inception in December 2015 (see Part 6), the FIRA provided his first formal report on Advance II, supporting the submission and noting that:

> *"The Alliance Team has prepared a design and associated cost plan that indicates the cost higher than anticipated for a building of this nature. This however gives reassurance that a building can be delivered to satisfy the Project Brief within the cost plan. The target cost is set at £9,990,652 which includes £552,068 of risk allowances. These risks would have to materialise in totality in order to place pressures on the Target Cost."* (FIRA Report, January 2016).

The FIRA commented further that he had undertaken an independent cost benchmarking exercise, both on the basis of Advance I and using the Building Cost Information Service (BCIS) construction cost data more generally. He concluded that, while the Advance II Target Outturn Cost (equivalent to some £2,017 per square metre of Gross Floor Area) was higher than the Advance I outturn (£1,930) and higher than the BCIS average for similar Further Education building types, it was lower than the BCIS upper quartile and highest values. As such:

> *"This indicates that the monies allocated to this project should be sufficient to carry the project to the satisfaction of the Project Brief within the investment target cost. Overall the above demonstrates that the Alliance team have endeavoured to provide an accurate cost plan that reflects the design work carried out to date and that they have a detailed consideration of the risks associated with the Advanced II project."* (FIRA Report, January 2016)

Working to achieve the Target Outturn Cost – Phase 2

Overview

The delay between the submission of the project for Policy Inception in December 2015 and confirmation of the IPI Policy at the end of February 2016 is noted in Part 4 above and Part 6 below. Following Policy Inception and the formal commencement of Phase 2, the Alliance progressed design development, targeting a start on site in June 2016 and completion some 12 months thereafter. The FIRA role was now established and the FIRA regularly attended Alliance Board meetings, received reports from the Target Cost Group and in turn provided regular reports on design development and on-site progress to the Insurers throughout the period up to project completion and handover in September 2017. These reports provide a substantive, independent

and consistent account of forecast costs against Target Outturn Cost, and how the Alliance worked towards achieving the Target, including the risks and challenges they faced and how they addressed them. This section of the report draws primarily on these FIRA reports to provide a summary account of key developments and the extent to which the Target Outturn Cost was achieved.

The table in Appendix 4 charts the development of the Cost Plan in relation to the Target Outturn Cost, as presented in selected FIRA reports covering Phase 2 through to completion. Overall, and from January 2017 in particular, following a period of some 6 months on site, forecast outturn cost began to exceed the Target, rising to some £0.25m (2.5%) above Target in July 2017, shortly prior to project completion.

Phase 2: 2016/2017 – working within the Target Outturn Cost

While a good deal of detailed design development took place in the early part of 2016, this was generally contained within the overall Target Outturn Cost. The Alliance continued the 'Opportunities and Risks' approach and, in the period up to start on site in June 2016, there were fluctuations in both the Opportunities and Risk categories. The Opportunities allocation in the cost plan submitted for Policy Inception amounted to some £0.44m, and significant elements targetted for savings included cladding and glazing (£0.18m) and Mechanical and Electrical Services (£0.11m). By mid-2016, opportunities for potential savings had been reduced by some £0.1m. Risks had also been reduced (by some £0.13m) . The FIRA report for August 2016 includes these changes, the reduction in the risk sum being offset by the increased costs of the IPI Policy – clarified since Policy Inception (see Part 6) – and slightly higher forecast costs for Fees (People Costs) and construction – see table, Appendix 4. It reports that overall, costs are on target despite these movements.

By November, a more positive picture was presented, with significant reductions in the risk allowance in particular showing that the Target Outturn Cost could be reduced by some £0.28m. This had resulted from a formal Opportunities and Risks workshop held with Alliance Members and facilitated by the IF on 13 October 2015. Key areas of risk reduction included:

- Maximizing gains from the project BIM Model (i.e. better efficiencies on and off-site)
- Developing a tighter programme plan that all partners will follow
- Review of piling, groundworks and frame group activity to better inform the master procurement plan and procurement strategy
- Considering incentivisation of trade specialists and suppliers

- Review of resources to streamline resources needed based on fresh review of people costs and programme activities
- Defining a series of 'critical date' to help manage expectations.

Whilst the outcome of the October Opportunities and Risks workshop was very positive, the IF, in a report to the insurers in early December reflected a more cautious view:

> *"Following the balanced and considered optimism of the O&R review workshop* [in October] *which led to significant opportunities being identified, there has been an understandable reaction this month* [November] *with some pessimistic evaluation of risks. This coupled with the genuine difficulties in recovering delay and the challenge to complete the fit for defined purpose sign off means the potential savings for early completion has also been removed. This negative fluctuation is no more definitive than the positive fluctuation last month, but never the less needs to be addressed. The Build in a Day workshop should assist this and the board will need to take a considered view on a number of new items being presented."* (IF, Report December 2016)

By December, further development of the cost plan and an ongoing reivew of Opportunities and Risks led to significant revisions in the risk reductions identified in October, and the need for additional provisions for site overheads ('Preliminaries') and Mechanical and Electrical installations in particular. The revised cost plan in December identified an increase in the Target Outturn Cost of some £0.29m compared to the October total. By January this had increased further, and the FIRA report that month now identified an increase of £0.09m in the forecast outturn cost as well as a small slippage in the construction programme. While the risk amount had been reduced below the provision in the Target Outturn Cost, construction costs had increased, mainly due to detailed design/construction changes covering a range of matters that were within the overall contract scope and thus the responsibility of the Alliance.

Phase 2: 2017 – key challenges in meeting the Target Outturn Cost

From early in 2017, the challenges of completing within the Target Outturn Cost and on time were becoming clearer and more persistent. The FIRA reports for February and March identify a relatively small overspend (c.£0.05m) but reflect Alliance Board concerns that delays in the early stages of the project are starting to impact adversely on progress and on site costs. These delays include:

- Delayed possession of the site from Dudley College
- Drainage diversion works – the Alliance had referred to this primarily in terms of an incorrect allocation of costs within the Target Outturn Cost

- Façade design – development of the façade design outside of the Alliance team whilst the team was ‘on hold’; see Part 4 and Part 7
- Insurance Policy Inception – delay to policy acceptance; see Part 4 and Part 6.

By April 2017 the FIRA report forecasts a likely overspend of some £0.23m. While most of the risk allowance of £0.55m has now been removed, construction costs are forecast as some £0.3m above target (in line with previous estimates) and, together with ongoing increases in Fees (People Costs) and the increased costs of the IPI Policy the overall overspend is some £0.23m. Further, the report records that the Alliance view the cumulative delays to amount to some 7 weeks on the project programme and will seek an extension of time of 3-4 weeks via the Review Event provisions (see also Part 4) in the Alliance Contract. The report also notes that, at this stage in the project – less than three months from the contractual completion date – there is little time remaining to take advantage of any residual opportunites in the Opportunities and Risks provision.

That position is generally confirmed in the remaining FIRA reports prior to project completion, with the forecast overspend rising slightly to some £0.25m by July. During June an Extraordinary Alliance Board Meeting was held (13 June) to review and agree Review Events relating to project delay. This extended the completion date to 11 August (see Part 4), with a Critical Need Date of 21 August. The FIRA report of July, the last report before project completion on 8 September, was issued before the Review Event proposal relating to cost recovery by the IPT of some £0.33m was sent to the Client. While that proposal reflected some of the cost increases identified in the FIRA report, it also included additional costs that the IPT felt they were carrying as a result of the time delay, issues with the Project Bank Account and IPI costs – see Part 4. Following completion, and as noted in Part 4 above, an agreement was reached between the IPT Members of the Alliance and the Client in November 2017 to revise the Target Outturn Cost downwards to £9.948m to account for drainage diversion and some additional IPT costs identified in the Review Event proposal. When remaining opportunities and risk amounts were taken into account, this resulted in an overspend of some £0.18m (some 1.8% of the revised Target Outturn Cost) which is to be shared among Alliance Members as ‘pain’ via the Gain Pain Share mechanism in the agreed proportions – see Part 6.

At the time of finalising this research report (January to February 2018), a final FIRA report had not been issued to provide a final reconciliation of outturn cost against target.

PART 6: IPI ON ADVANCE II – CONTRACT, PAYMENT MECHANISMS AND THE IPI POLICY

Introduction

The IPI Model is supported by a range of formal 'mechanisms' designed to support particular aspects of collaborative working:

- The **Alliance Contract**, essentially a new form of construction contract with specific provisions for collaborative working and the sharing of risk and reward in a multi-party contract under the IPI Model.
- The Commercial Model as part of the Alliance Contract, and the **Gain/Pain share mechanism** governing arrangements for apportionment of reward or loss among the Alliance members when outturn cost exceeds or is less than the target cost plan.
- The **IPI insurance policy** which insures the Alliance as a virtual company covering the project as a whole including financial risk (cost overrun).
- The **Project Bank Account**, essentially a ring-fenced bank account to help ensure that all parties are paid on the contractually agreed payment dates.

The development and use of each of these mechanisms on Advance II will now be reviewed.

The Alliance Contract

Development of the Alliance Contract

The Alliance Contract used on Advance II was developed over a number of years by the principals of IPInitiatives with input from a range of experts including lawyers from K&L Gates and Nabarro. The developers acknowledge that their early thinking was informed by examples of the use of alliance contracts in other sectors (eg in the 'Oil and Gas' sector: see Scott, 2001) and in other countries also (eg in the USA, and in Australia and Asia also: see Morwood, et al, 2008.) While alliancing tends to be more prevalent in infrastructure development – see, for example, the Infrastructure Client Group (ICG), 2016 – the form of Alliance Contract developed as part of the IPI Model was intended to apply to more general construction projects also. The Alliance Contract used on Advance II is, at the time of finalising this report (January to February 2018) undergoing further development by IPInitiatives, and the full text of the contract remains confidential both to the signatories on the Advance II project and to IPInitiatives and their

advisers. Copies are available for consultation via IPInitiatives, though the use of the Contract is currently restricted to projects involving that organisation.

This short review identifies the key features of the Alliance Contract developed for trial on Advance II (Edition 1) and changes proposed as a result of an ongoing review by IPInitiatives over the course of the project leading to two revisions:

- Edition 1, Revision 1 issued in July 2016
- Edition 1, Revision 2 issued in May 2017.

Key provisions

The Alliance Contract is between the client and the other members of the alliance acting together as the Integrated Project Team (IPT). Under the Contract, the Alliance Members agree to establish an alliance to execute the project in accordance with the Strategic Brief and within the agreed Investment Target. As a multi-party agreement, the Contract differs from many other standard forms of construction contract currently in use in the UK construction. It requires the Alliance Members to work "in a spirit of mutual trust and co-operation" and in accordance with Alliance Principles, derived from the FUSION approach – see Part 5: *Developing the team – FUSION Principles*. These principles are defined in the Alliance Contract Annex. More specifically, the contract is designed explicitly to support the IPI Model, and includes provisions for:

- the alliance members comprising the IPT to act collectively; their liabilities to each other are 'several' but not 'joint' (nor joint and several), meaning partly that no individual member represents the alliance or enters into agreements on its behalf.
- project risks, covering most of the risk typically allocated either to the Employer or the Contractor under standard contract forms.
- a range of specific arrangements that support the IPI Model, including:
    - sharing the benefit of cost and time efficiencies and the burden of cost overruns and delays by the Alliance Members through a Gain/Pain share mechanism (see later in this Part) set out in the contract.
    - project insurance in the form of an IPI Policy, taken out by the client in the names of those insured to underwrite project risks and the financial outcome of the project. This policy insures all parties working on the project on the same terms, and the Insurers waive their rights of subrogation (see Part 2 above, and further below in this Part). The only policies that Alliance Members may need to maintain

are specialist policies, such as the statutory employee liability, automobile and marine cargo policies.
    - governance and management arrangements for the Alliance, including the constitution and operation of the Alliance Board and the role of the Alliance Manager.
    - an Independent Facilitator (IF), appointed by the client, to support collaborative working, innovation and a 'no blame/no-claim culture' amongst the Alliance Members and Suppliers, in line with the IPI Model.
    - independent risk assurers (TIRA and FIRA), appointed by the client, to evaluate and advise on the technical and financial risks associated with the project. While the contract provides for the novation of these appointments to insurers on inception of the IPI Policy, this did not happen on Advance II (see further below, and in Part 8).
- 'Review Events', to allow for the management of a limited range of occurrences that are expected to have a significant effect on the time, cost, opportunities or risks of executing the project. A key effect of a Review Event could be to increase the target cost thereby preserving entitlement to 'Gainshare' (see further below).
- no liquidated damages for delay or poor performance.

A range of other, more detailed provisions are also included and these may be viewed by consulting the Contract document available through IPInitiatives.

Use on Advance II

Summaries of the proposed Alliance Contract were provided to project bidders in the PQQ document for Advance II, outlining how the contract was intended to work, and its key provisions. A draft Contract was made available to preferred bidders in the ITT (see Part 5). This draft was acceptable to all Alliance Members and signed by them in March 2015 before submission to the client for signature. The Contract was not formally executed until May 2015, the delay due mainly to delays in client-side conformance requirements (see also Part 4 above, and Part 5: *Commercial Alignment on Advance II*). The executed Contract, dated 8 May 2015 incorporates some minor technical changes introduced via a corrigendum to the Contract in April 2015. These helped to clarify the status of the Commercial Alignment process vis a vis work under the Contract, ie that contract commencement is dependent on the conclusion of Commercial Alignment and that recovery of Alliance Members' costs can only be done after Phase 1 commences (see Part 5 for further details).

The accompanying InnovateUK research report: *Work Package 27: Behavioural change engendered by the Alliance Contract* issued in August 2016 was intended to provide an interim review of the extent to which the Contract was supporting collaborating working on Advance II. That report is based on interviews with selected Alliance Members in the summer of 2015 (ie during Phase 1 of the IPI Model; see Part 2 above) and a follow up self-completion questionnaire issued in May 2016 (following Policy Inception and commencement of construction, ie in Phase 2) to all Alliance Members. While some five Alliance Members took part in interviews, responses to the questionnaire survey were very limited, with only 3 Members responding. Nonetheless, initial indications were that those Members responding viewed the contract positively as a facilitator of collaborative working, and had no major misgivings about specific terms and conditions. Interestingly, the client representative noted:

> *"I was pleasantly surprised that it didn't take too long for all of the signees to sign up. Because it could have been a stumbling block from the start…to go to and forth with solicitors to change this and that, but there was very little, if any, of that which was good. I was slightly surprised that the document had a draft version flavor, but I suppose that's all part and parcel of the fact that we're trialling the project, aren't we, and nothing's going to be 100% perfect from day one."* (Client)

It is, of course, difficult to isolate the potential impact or effectiveness of the Alliance Contract on Advance II – the overall IPI Model is more appropriately considered as a package of arrangements that are interrelated and, to a large extent interdependent. However, representatives of all the Alliance Members together with other project stakeholders (see Parts 3 and 5, and Appendix 2) were interviewed in the period immediately prior to and following Completion in August 2017 about their views on project outcomes, including the role of key 'mechanisms' covering the Contract and other matters. Respondents did not, generally, comment on the role of the Contract to any greater extent than other aspects of the approach. The picture emerging from this material is of a document that was used actively during Cultural Alignment in the run up to contract execution, and subsequently referred to occasionally as Alliance Members sought clarification of how aspects of the approach – relating, for example, to the target cost and agreed completion dates – should work. Indeed, some respondents felt that, in particular, once the IPI Policy had been incepted and Phase 2 had got underway, Alliance Members needed to be reminded from time to time of Contract provisions and the form of working required under them. The IF explained:

> *Now having got the insurance did anybody do much with it? No. Did they do much with their contracts? No.* [We] *as the independent facilitators had to regularly remind them:*

this is what the contract says, this is what the insurance covers. But then we had a theft event [theft of materials stored on site] *and that forced people to actually start to take notice of what the insurance said, and of course the review event has been very testing…, there is an extension, etc, etc. So towards the end, you only really look at the detail of policy if you have to."* (IF)

Others noted the more active, contract management role played by the IF:

"I think what has been really important at Dudley is how… [the IF] have managed the alliance contract. And that has been really key, so as and when challenges come along… [the IF] *has been pretty forcible in saying, go away and read your contract: 'this is what happens in these circumstances, not what you think, it's not a traditional contract, this is how we're going to solve this difficulty'."* (Insurance Broker)

This sense of a lack of interest by Alliance Members in contract provisions is partly explained by the novel (and perhaps even proto-typical) nature of the trial of IPI on Advance II, and the collaborative 'best-for-project' approach engendered through the application of all of the IPI 'mechanisms', including facilitation. There is a strong sense from respondents' accounts that Alliance Members generally were focused on improving quality outcomes through collaboration, to a degree that at times ignored more commercially-focused, contractual implications. The fact that the 'Review Event' condition in the contract was not invoked (in relation to the anticipated cost overrun – see Part 5) until July, close to the required Completion date, would seem to support such views, as the IF noted:

"But again we were trying to get a grip around this new process and everybody was confident it'd all be all right. [X]*...should have advised them that that's a review event, it shouldn't have happened and we should have agreed what we were going to do about it…. And as a result we're in* [a] *pain situation at the end where it didn't get resolved earlier on, it wasn't nipped in the bud … Because what they've carried on doing is saying, well actually we're all in this together."* (IF)

The need for more active contract management within the IPI Model than was evident on Advance II is taken up further in lessons learned and recommendations for improvement in Part 8.

At the time of writing, issues arising in relation to the Review Event (see Part 4) have been resolved. At this time also, no disputes have arisen under the Contract.

Contract revisions

During the Advance II project the Alliance Contract was subject to further development by IPInitiatives (supported by legal experts), partly as a result of experience on Advance II, and partly to add further improvements already planned. Two revisions to Edition 1 of the contract (the form used on Advance II) have been issued for possible use on further projects that may adopt the IPI Model:

- Revision 1 issued in July 2016: the main changes are in the provisions for Suspension and Termination which were restructured into tabular form more akin to their treatment in the NEC suite of contracts.
- Revision 2 issued in May 2017: this revision included a range of technical changes, including wording updates to bring the Contract into line with the Corrigendum on Advance II clarifying Commercial Alignment matters (see above). It also includes changes necessary to reflect suggested changes to IPI procurement practices following a review of compliance with Public Procurement Regulations in 2016 (see Part 5 below: *Complying with procurement regulations*).

A further significant development has been the development of a matching subcontract – the Supplier Alliance Subcontract – for use with the Alliance Contract. No such form was available for Advance II and subcontractors and suppliers were appointed by the constructor member of the IPI on the basis of the NEC Short Form of Subcontract, amended to accompany the Alliance Contract The new Supplier Alliance Subcontract is designed to bring key suppliers (for major elements such as frame, façade, ductwork etc) into a close relationship with the Alliance Members, though under the control of the Alliance Partner that let the subcontract. It includes arrangements for:

- Engaging all types of suppliers and subcontractors
- Integrating the supplier within the IPT, including as appropriate the supplier's potential contribution to innovation on the project and a share of Gain/Pain
- Clarifying any interface between the coverage of a manufacturer's own product design insurances and the IPI policy
- Other arrangements, including whether suppliers can take part in the Project Bank Account arrangements.

Currently the Supplier Alliance Subcontract is being reviewed by legal and insurance experts, and Edition 1 is essentially a consultation draft.

The Commercial Model and Gain/Pain share mechanism

The commercial model

The Alliance Contract includes a 'Commercial Model' which, together with the IPI Policy (see further below), is intended to create a workable commercial framework that supports and motivates integrated collaborative working. The essential basis of the Model is that a challenging cost target (the Target Outturn Cost) is set for project delivery, and Alliance Members' respective costs in executing the project are reimbursed up to the target amount. The Model includes an incentive scheme to help ensure that costs incurred are less than the target. Under the Model Alliance Members share cost information to help ensure that each understands the value and benefit of proposed (or incurred) costs to project outcomes, and this is the basis for 'commercial alignment' to be achieved following contract commencement.

The Commercial Model is described in detail in a series of Annexes to the Alliance Contract. These can be made available by IPInitiatives. How the Commercial Model works is summarised briefly below so that the following review of its operation on Advance II can be considered. For cost reimbursement purposes, the Model recognises three components of project cost:

- The Defined Cost, comprising:
  - Direct costs, including costs for People, Equipment, Plant and Machinery
  - Project-wide specific overheads, including site costs (utilities, etc), insurance costs (IPI Policy and associated costs, including independent facilitation and TIRA/FIRA costs)
- Alliance Member company overheads and profit (OH&P)[14] – agreed by Alliance Members as a percentage addition to their respective 'people costs' (staff) on the project
- Suppliers' costs.

The Model provides separate arrangements for the reimbursement of these different components of cost, across different phases of the IPI project process. These arrangements are intended to encourage the Alliance Members to work together to produce 'best for project' outcomes, to eliminate waste and to share in the reward of positive project outcomes (or risk of negative outcomes). Following a process of Commercial Alignment– during which Alliance Members agree the components of the Defined Cost, the people who will work on the project and each Member's OH&P percentages (see Part 5); essentially identifying the broad parameters of the

[14] Guidelines on the calculation of Overheads and Profit were prepared by IPI Ltd and issued to preferred bidders on Advance II – see Appendix 5.

Model – the project moves into Phase 1 of the IPI Model. How the Model is intended to work in this Phase and in Phase 2, in outline, is as follows:

- Phase 1 – this is when the Alliance Members work together to identify a project scope that will achieve a 'fit for purpose' outcome, as well as a challenging target cost (called the Target Outturn Cost) for delivering it. A Target Completion Date is also agreed during Phase 1, and the outcome of Phase 1 is a proposal for IPI Policy inception – see later in this Part. Once agreed, the Target Outturn Cost becomes the basis for the reimbursement of all project costs in the project execution phase (Phase 2 – see below). Reimbursement of Alliance Members costs for Phase 1 is on the basis of a budget for Phase 1 work agreed by the Alliance shortly after work commences, and showing each Member's share. It covers each Members' Defined Costs only (ie company overhead and profit is not reimbursed during in full during Phase 1, although there is provision for a proportion to be paid).
- Phase 2 – is when the Alliance Members work together to deliver the project to the Outturn Target Cost and Target Completion Date (or better). The Alliance Members are incentivised to deliver at a lower project cost than the Target Outturn Cost, and sooner than the Target Completion Date, by being offered a share in any gains made. A similar disincentive is applied for exceeding the Target Outturn Cost and/or delivering beyond the Target Completion Date. The incentive scheme is referred to as the Gain/Pain Share Mechanism (see below). This is agreed as part of work in Phase 1 but is not operational until Phase 2. Reimbursement of Members' Defined Cost is made in relation to progress against the Target Outturn cost, as are suppliers' costs. The total amount of Members' OH&P is fixed in relation to the Outturn Target Cost (this fixed amount is called the Ring Fenced Sum) and is paid in accordance with progress but does not vary with the level of 'final' (actual/achieved) outturn cost.

By reimbursing Alliance Members for costs they incur (and control) on the project, protecting their overheads and profit, and incentivising improved performance (and dis-incentivising non-achievement of key cost and time targets), the Commercial Model is intended to encourage them to work together to achieve positive project outcomes.

Incentivisation: the Gain/Pain Share Mechanism

Incentivisation of improved performance via the Gain/Pain Share Mechanism is at the heart of the Commercial Model - Figure 2 in Part 2 above outlines the basic principle. Essentially, the mechanism rewards Alliance Members for improving on (or penalises them for failure to meet) the Target Outturn Cost and the Target Completion Date. The incentive may be apportioned

between cost and time performance to reflect their relative importance. It is possible also to add key criteria (for example, relating to cost-in-use performance) to the incentive scheme to reflect their relative importance. The Model in its basic form provides for incentivisation of cost and time elements only, and this is what was implemented on Advance II.

In outline, the Gain/Pain Share Mechanisms works as follows:

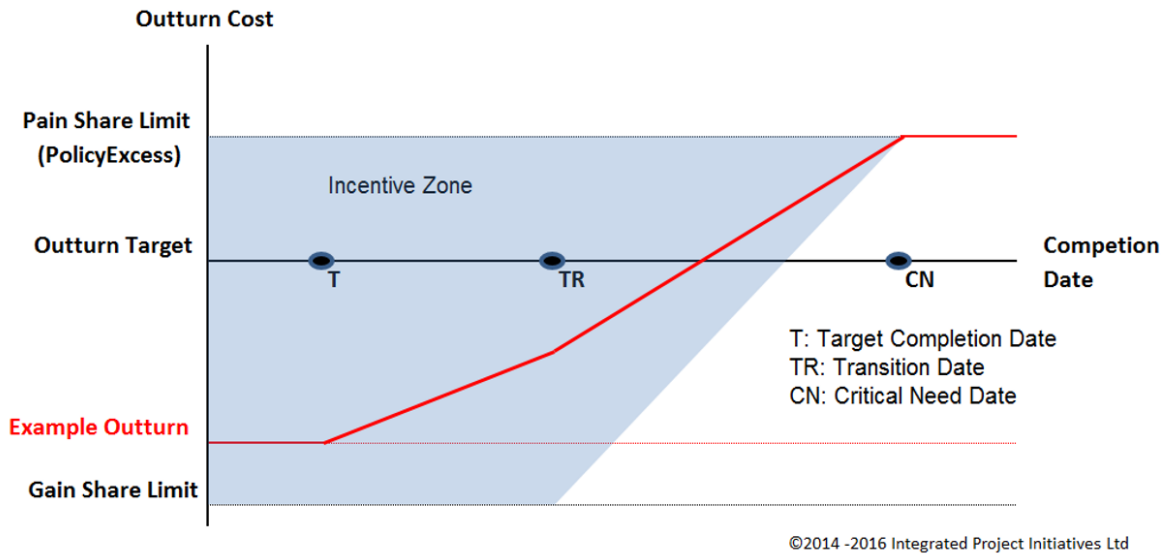
- In addition to agreeing Members' shares in 'gain/pain' in Phase 1 (see above), limits of gain and pain share are also agreed. A gain share limit helps ensure that capital cost reduction is not pursued to the detriment of other criteria. The pain share limit is the IPI Insurance Policy excess, above which the Policy pays out up to a maximum liability cap (this is explained further below).
- Achieving a Final Outturn Cost at completion that is lower than Target Outturn Cost creates an incentive payment to be distributed among the Alliance Members in the agreed shares. Similarly, if the Final Outturn Cost exceeds the Target Outturn Cost, the overspend (up to the Policy excess) is allocated to Alliance Members in the agreed proportions.
- Similarly, time improvement/overrun in relation to the Target Completion Date triggers an incentive payment or liability for the Alliance Members, in the proportions agreed in the mechanism for time and cost. Note that the IPI Insurance Policy recognises the interrelationship of time and cost by covering cost overrun no matter how it has been caused.

Figure 7 below helps illustrate how the mechanism is meant to work. A further refinement is applied in relation to time, by adjusting the incentive payment for the progressive impact of ongoing delay. This generates a 'sliding scale' of reducing incentive for time performance in relation to three key dates (all of which are agreed at the end of Phase 1):

- The Target Completion Date (T) – if the project achieves completion on or before this date and for less than the Target Outturn cost it will attract 100% of the incentive, apportioned between cost and time as agreed by the Alliance
- The Transition date (TR) – for completion after the Target Completion Date but before the Transition Date, the *time* incentive is reduced from 100% at T to nil at TR.
- The Critical Need Date (CN) – for completion after the Transition Date, the outstanding cost incentive is progressively reduced until exhausted and the penalty (pain share) is incurred until the Critical Need Date is reached at which point 100% of pain share is incurred (but see further below on how this element operated on Advance II).

Note that once full pain share (the amount equal to the IPI Insurance Policy excess) is incurred, no further liability for overspend rests with the Alliance, and additional costs to complete the project are paid from the IPI Policy up to a liability cap. If this cap is exceeded any additional costs are the liability of the client.

Figure 7 Illustration of the operation of the Gain/Pain Share Mechanism, adjusted for time performance



The shaded area represents all possible incentive outcomes. The example adjusted profile in red is for a project with equal cost and time incentive allocation delivered with the same underspend on all possible completion dates. Source: IPInitiatives, Alliance Contract Annexes, Edition 1, 2014.

A spreadsheet-based 'Interactive Incentive Calculation Tool' (see sample screenshots, Appendix 4) has been developed by IPInitiatives to calculate Gain/Pain share for different combinations of actual (forecast) outturn cost and completion dates. The precise details of the algorithms used are commercially confidential, and details in Appendix 4 are an illustration only of the Gain/Pain shares on Advance II for key cost/time scenarios.

The Commercial Model/Gain-Pain Share on Advance II

On Advance II, following Commercial Alignment, the development of the initial investment target and target cost plan leading to agreement of the Target Outturn Cost was a prolonged process taking place over several months between May and December 2015 (see Part 5 above, and the accompanying InnovateUK research report *WP22: Processes of Updating the Cost Plan*, March 2016). Discussions between Alliance Members on gain/pain share arrangements took place simultaneously throughout this period. In summary, the agreement of the initial investment target (of £11.685m in May 2015) provided the basis for the further 'commercial alignment' of the Alliance Members, covering the make-up of each Member's remuneration of defined costs,

project overheads and company overheads and profit. Details were finalised in December 2015 and agreed at that month's Alliance Board meeting, when Members' respective shares in the Gain/Pain Share Mechanism were also finalised and agreed. These details were recorded in the Alliance Contract (Contract Annexes are designed to be live 'documents' for completion subsequent to contract execution) and provided the basis for the submission of the project for IPI policy inception (see below under *The Insurance Policy*).

Precise details of the Defined Costs and Ring Fenced Sums of each of the Alliance Members are commercially confidential, though it may be noted that company overheads and profit (Ring Fenced Sum) varied from 60% of the 'people costs' element of Members' Defined Costs to 128%. The main provisions in the Commercial Model for Advance II, incorporated in the Alliance Contract, are shown in Table 11 below.

Table 11 The Commercial Model for Advance II

Cost element		**Time element**	
Target Outturn Cost	£9,990,560*	Target Completion Date***	2 June 2017
Ring Fenced Sum (IPT only)	£874,516	Transition Date	30 June 2017
Gain Share Limit (Maximum available)	£750,000	Critical Need Date	21 July 2017
Pain Share Limit (Policy excess)	£590,000**		
IPI Policy Financial Loss cover (above excess)	£1,800,000**		
Cost success incentive	75%	Time success incentive	25%

Notes:

** This amount was subsequently reduced to £9,948, 652 – see Part 4.*
***The first £390k above target outturn cost is payable by the Alliance as an IPI Policy excess, together with 10% of any claim above this excess. As financial loss cover under the IPI Policy is capped at £2m above £390k (£1.8m above £590k), the pain share limit for Alliance Members is £590k (ie £390k + 10% of £2m) – see further under the Insurance Policy below.*
**** The Target Completion Date was subsequently revised to 11 August 2017 – see Part 4*

The six Alliance Members (including the client) generally decided to split the potential Gain/Pain equally, with the exception of the Structural Engineer, who requested a lower share, leaving five equal shares at 18.6% per organisation, and one at 7%. In the FIRA's January 2016 Report, it was noted that:

> *'Although this level of apportionment* [with the majority of Members taking an equal share of risk and reward] *is unconventional, it does indicate a high degree of confidence in achieving or bettering the target cost, especially from the design consultants... We have also received confirmation from each party that they understand and accept the Gain/Pain*

calculation and proposal. The Gain is split into the same proportions with a maximum total cap at £750,000.' (FIRA, January 2016)

The Client representative expected Alliance Members to agree Gain/Pain shares that were more in line with their respective contributions to (and payments from) the project:

I'll be honest, I went into the meeting expecting that to be the outcome …when it was then said by the designers, well no, we're all in this together so we should all have equal shares. That actually brought the College's share down.'

And further:

'… some of the risks I don't think were recognised by all, and there was a… principled approach to, well we're all in this together so we'll all have the same percentage of pain/gain share, which I believe was a commercial mistake. And that's what's led to some of the issues now arising where you've got some of the members who are, I don't know, into £200,000 or £300,000 worth of work have the same pain share as [the Constructor] *who's into £8 million worth of work going through their books, and a pro rata overhead and profit figure based on those proportions. I think the decision was made from a principle point of view trying to make the* [process] *work, not trying to spend ages going through commercial alignment before we could hammer out an agreement ….* (Client representative)

How Gain-Pain Share worked on Advance II

Once agreed, the potential implications of the Pain/Gain Share agreement were reviewed by the Alliance through regular use of the 'Interactive Incentive Calculation Tool'. In the later stages of the project, potential cost and time overruns began to be identified. The implications of the potential time delay in terms of its impact on possible pain share were seen to be disproportionately disadvantaging the IPT Members of the Alliance – in the Gain/Pain Share Mechanism, the client member of the Alliance does not incur any 'pain' for time adjustment. As illustrated in Figure 7 above, the impact of progressive delay – especially beyond the Transition Date – can be punitive, and ultimately erode all of the cost-related gain and incur potential pain also. An extract from the Interactive Tool for the March 2017 Alliance Board meeting, for example (see Appendix 4) shows that, on the then forecast completion date of 24 July, all of the IPT members' maximum pain share would be exhausted, even though only a small cost overrun (c£57k) was anticipated. The IF explained that, as the Alliance had assigned relatively low priority to time compared to costs (25:75), they had not intended time to become such a critical factor:

'Now at Dudley we have made a mistake in that we have allowed that incurring of time-related pain share to go all the way up to the full pain share value, even though we've capped the time component at 25%. That has the effect of making the time related pain share to be late very punitive, not what we intended. So [for the next iteration of the Commercial Model] *we've already taken on board the learnings we have capped the amount of time related pain share to be whatever proportion …of the incentive we've got associated with time. Having put 25% of the total associated with time, that's the maximum pain share that you'll have to incur for being late. So if you've got a project that time is actually critical you put 80% down, but if it's not critical and you put 25% down it shouldn't then become critical, which is what's happened at Dudley… That was an error, we didn't mean it, didn't mean it to be as punitive as it turned out at Dudley…. And at Dudley it's been resolved, the client's also looked at it, we've all agreed it's punitive, and so they've given us an extension of time, which has alleviated the situation ….'* (IF)

While the main reasons for agreeing an extension of time for the project (moving the Target Completion Date to 11 August) are noted in Part 4 above, recognition of the unintended impact of the time-related pain share on IPT Members was also an important consideration. The second extract from the Interactive Tool in Appendix 4 from July 2017, following agreement of the extension of time in June, shows that there is now no time-related pain, although the cost-related pain has risen in line with the increased forecast of outturn cost.

Note also that, based on the details of the Commercial Model (Table 8), the maximum pain to be borne by the IPT Members of the Alliance is £590k . This is lower than the IPT's combined Ring Fenced Sum of £875k although it should be noted that only a part of this is profit. Whilst the Alliance Members did not provide details of how overhead and profit is split, the FIRA estimated the profit element to be between £250k and £350k ie, the profit would be expended before the maximum Pain share is reached. The issue of profit being potentially payable to IPT members following an insurable overspend was queried by the insurers prior to IPI policy inception; this is covered further below under *The Insurance Policy*.

An initial assessment of the operation of the Gain/Pain Share Mechanism is provided in the accompanying InnovateUK research report *Work Package 31: Review impacts of the gain/pain-share arrangements are having on meeting the success criteria* (University of Reading, August 2016).. At that point, however, cost and time forecasts on the project were in line with the target cost and completion dates, and no detailed analysis was possible of likely Pain/Gain Share scenarios.

At the time of finalising this report (January 2018) matters relating to the Review Event had been concluded and a project overspend of some £180k confirmed (see Part 4). While this takes the Alliance into Pain Share (5 of the 6 members each bearing some £33.5k, a sixth bearing £12.6k), it does not invoke the cost overrun element of the IPI Policy as it falls well below the lower excess limit of £390k.

The Insurance Policy

Development of the Policy

The Integrated Project Insurance (IPI) Policy is an innovative form of single project insurance that is core to the entire IPI Model. In brief, it covers the design and construction team as a virtual company (the Integrated Project Team – IPT) in an Alliance with the client for all risks, including third party liability, delay in project completion, cost overrun and latent defects.

From the early days of the development of the IPI Model, insurance brokers Griffith & Armour (G&A) have been involved with IPInitiatives, providing advice on the insurance aspects of the approach, ensuring that potential insurers have been engaged in developments, and generally advocating the idea of integrated project insurance in construction – see Bamforth (2006; 2013). Throughout 2015 and, in particularly in the period following agreement of the Alliance Contract on 8 May 2015, G&A have worked to engage potential insurers specifically in the Advance II project with a view to securing agreement to write an IPI policy for the project/IPT. This engagement is described in the accompanying InnovateUK research report *Work Package 23 - The process of IPI policy inception* (University of Reading), which also describes the background to the policy and its key features in some detail. An additional report also covers the development of policy wording: *Work Package 12: The development of the initial IPI Policy wording* (IPI Initiatives Ltd).

The draft IPI Policy for Advance II was prepared by G&A in consultation with IPInitiatives and potential insurers. This draft provides for a combined IPI policy that insures the Alliance Members (including the client) against all usual construction risks and third party liabilities and provides, in addition, financial loss and latent defects cover. The draft is explicit that in granting such cover the insurer(s) believe that a number of 'fundamental principles' are adopted by the Alliance Members (including the client) concerning

- fully integrated collaborative working, whereby all act in a spirit of mutual trust and co-operation at every stage of the project and comply with the Alliance Principles set out in the Alliance Contract.
- mutual no-blame/no claim undertakings

- all decisions being taken on a 'best for project' basis
- the availability of independent facilitation and financial/technical risk assurance at all stages of the project.
- the measurement of the performance of the Alliance Members against agreed success criteria.
- working on an open book basis and seeking ways of driving down costs and maximising gainshare by over-achieving against the success criteria
- making no distinction or barriers between the design and construction elements of the project so that all the members work as a single integrated team.

The IPI Policy wording developed during Phase 1 was subject to relatively minor technical changes and agreed by all the parties – Dudley College, the Alliance Board and the insurers – immediately prior to policy inception. This is currently confidential to the originators and signatories on Advance II.

The Process of Policy Inception

Pre-inception

The process leading to IPI policy inception on 1 March 2016 is described in some detail in a companion report in the series available on this InnovateUK project: *Work Package 23 - The process of IPI policy inception* (University of Reading), and a brief summary is presented below. The development of the project Cost Plan and agreement of the Target Outturn Cost (described in Part 5) together with agreement among Alliance Members of their respective shares in the Gain/Pain Share Mechanism (described above in this Part) signalled the completion of Phase 1 and provided the basis for the submission of the project for policy inception in January 2016.

In advance of this, as noted, G&A had been working with potential insurers during 2015 to help them understand the nature of IPI, the extent of cover to be provided and the particular circumstances and risks on Advance II. Towards the end of 2015, two organisations were identified as potential preferred insurers (at the time of finalising this report – January to February 2018 – their identities are confidential), covering:

- Contract Works, Public Liability and Financial Loss insurances, and
- Latent Defects insurance.

. Given the novel nature of the IPI Model in the UK, both G&A and IPInitiatives felt it was important to hold a ‘pre-inception’ meeting between representatives of the insurers and their underwriters, and Alliance Members prior to the formal submission of the project for policy inception. This was held on 9 December 2015 and was designed to give the underwriters in

particular (who evaluate risk on behalf of insuring organisations and help determine the premium to be levied) an opportunity to meet and query Alliance Members, gauge their commitment to the collaborative approach under IPI and to achieving a positive project outcome, and to understand the costs and risks involved. The TIRA and FIRA also attended. This was the first formal meeting between Alliance Members and insurers and represented a key milestone on route to policy inception. Full details of that meeting are provided in the accompanying *WP23* report. In summary:

- The Alliance representatives attending the meeting presented a very positive report on the project and on progress to date with design development, noting in particular their good working relations, their commitment to collaborative working and the IPI Model, and their work on developing innovative solutions on the environmental servicing strategy in particular
- The TIRA and FIRA generally supported Alliance Member's comments on progress with design development
- The underwriters queried Alliance Members, the IF and the TIRA and FIRA on a range of matters including the detailed operation of aspects of the IPI model, the structure and operation of the Alliance and IPT (and associated arrangements for profit allocation and Gain/Pain share), progress with design development and key project risks.

While on most issues the insurers/underwriters were satisfied with responses provided, a query on the potential for profit allocation following an insurable event was not fully resolved at the meeting. Their interpretation of the Ring Fenced Sum arrangements in the Gain/Pain Share Mechanism (see above) was that this could provide Alliance Members with an element of profit, regardless of outcome. So, in the event of an insurance pay-out (eg should outturn cost exceed target by more than the policy excess), the insurers believed they would incur costs while at the same time Alliance Members were taking some measure of profit on the project. IPInitiatives noted that this was not how Gain/Pain Share worked, and agreed to provide further clarification following the meeting. Nonetheless, concluding discussions focused on the necessary next steps to policy inception, and the meeting ended without any sense that this issue was unresolvable or a major impediment to policy inception.

Finalisation of policy details and inception

Following the pre-inception meeting, the Alliance continued work on design development and key members – including the IF – provided further detail to underwriters in response to queries raised at the December meeting. At the Alliance Board meeting on 26 January 2016, the project design described in the Project Execution Plan (PEP) and the Cost Plan showing a Target Cost of some

£9,990k were agreed and endorsed for policy inception. Reports from TIRA, FIRA and IF were all submitted to the underwriters by the end of January (see *WP23* report), supporting the Alliance submission for policy inception.

During January 2016, and as a result of underwriters' queries on profit allocation in the Ring Fenced Sum, IPInitiatives and G&A provided an analysis of Alliance Members' costs to help assure underwriters that no profit would be earned in the event of an insurance pay-out (ie if the Alliance incurred maximum pain-share):

> *'The gain-share/pain-share mechanism rewards collective achievement against the success criteria, but can create real pain in terms of failure to achieve. In the unlikely event that maximum pain-share was incurred, it would remove over half of the Ring-fenced Sum, wiping out all profit and much of the corporate overhead costs. No partner would receive any profit and all would incur a reduction of overheads.'* (Correspondence between IPInitiatives and G&A, 14 January 2016).

Subsequent discussions between Griffiths & Armour and underwriters/insurers in January and February 2016 led to an offer of insurance terms to the Alliance. On 26 February 2016, Dudley College, on behalf of the Alliance Board, confirmed acceptance of the IPI policy terms. The IPI Policy was formally issued 1 March, confirming that the IPI Model had moved into the delivery phase for the first time.

The project programme immediately prior to the submission of the project for policy inception had allowed a period of 8 weeks for this process. However, the time taken time taken for policy inception (from the initial meeting in December 2015 to the placing of the Policy on 1 March 2016) was some 17 weeks, 9 more than planned.

Use of the Policy on Advance II

The use and effectiveness of the IPI policy on Advance II is described in some detail in a companion report in the series available on this InnovateUK project: *Work Package 39 – Review of the effectiveness of the IPI Policy* (University of Reading), and a brief summary is presented below.

Policy cover and key features

The key distinguishing feature of the IPI Policy on Advance II is that it covers all the conventional construction risks and, in addition, includes for latent defects and cost/time overrun cover in a single policy that insures the Alliance and the client. In terms of the risks covered, the IPI Policy on Advance II provides for:

- Construction All Risks: the cover provided is similar to standard 'Construction All Risks' cover, to a sum insured of some £9.99m.
- Third Party Liability: The cover provided is similar to liability insurance cover generally provided in construction, to a sum insured of £10m. For Advance II, Employers Liability was excluded from this cover, with the insurance brokers recommending that this form of insurance should remain with the various Alliance parties.
- Delay in completion of the construction project: traditional delay cover tends to be designed to insure against loss of rental income arising from delay following insured damage. This was not required on Advance II. Instead, the approach was to consider the impact of delay in terms of increased *costs* of delivery (for example, acceleration costs to recover lost time, contractor's preliminaries, and other matters). In this way delay costs are covered under the financial loss section of the policy – see below.
- Financial loss (including budget overrun): this essentially covers the extent to which the outturn cost exceeds the target cost, for a wide range of reasons. The sum insured was £2m.
- Latent Defects (for 12 years): The cover applies to latent or inherent defects in the building structure (including external walls/cladding, floors and stairs, roofs and roof structures, and engineering services) up to a period of 12 years from completion. The sum insured was some £9.99m.

A key feature of the IPI Policy is the provision of Financial Loss cover. On Advance II, the target cost, agreed in January 2016, was some £9.99m, including a risk allowance of some £552k – see analysis in the FIRA Report (21 January 2016, Appendix 4). This is the 'insurable' cost under the IPI Policy, ie the amount above which a project outturn cost would trigger the Gain/Pain Share Mechanism and, ultimately, the Financial Loss cover under the policy. The agreed pain-share above this sum (ie to be expended if the total target cost is exceeded and before the Financial Loss cover is triggered), is some £390k – see above under *Gain/Pain Share Mechanism*.

An important exclusion from Outturn Cost is cost 'as a result of or in connection with a Review Event' under the Alliance contract. This is significant to the account of the Advance II project presented here as, during the latter stages of the project (July/August 2017) the Alliance Partners submitted notice of a Review Event under the terms of the Alliance Contract to the client requesting an increase in target cost of £333k. Issues relating to the Review Event have been resolved - this is discussed above in Part 4: *Advance II – Project summary and key outcomes*.

Insurance costs

The accompanying *WP39* report provides a detailed analysis of the costs of the IPI Policy. In summary:

- Initial expectations by the IF and insurance brokers were that additional costs of the IPI Model (including the policy premium and also the fees for FIRA, TIRA and IF services) would be in the region of 2.5% of the target costs. This was published in IPI Guidance (IPInitiatives, 2014) to help clarify how IPI would work.
- A provision of 2.5% of the investment target of c.£11.685m (less IPI costs) was made in the Advance II cost plan from early 2015 onwards. This amounted to some £294k towards the end of 2015. No explicit allocation between policy premium and other IPI costs was made as part of this estimate.
- By January 2016 the revised cost plan confirmed that the project target cost for insurance purposes was £9.99m, but the earlier provision within the cost plan of £294k for IPI costs – based on 2.5% of the £11.685 investment target – was retained.
- The cost plan provision for insurance costs was raised to some £402k on Policy Inception, (some £109k above the initial provision) following clarification of the policy premium and associated costs during the underwriting/inception process and agreed as a result of subsequent negotiations between the Alliance and the insurers.

The initial cost plan provision for IPI costs of some £294k was indicative only, and the parties involved (IPInitiatives and G&A) agree that no detailed assessment of the likely premium and associated costs could be made as a basis for it, as insurance costs are set on an assessment of risk for specific project and market circumstances. An important consideration in reviewing insurance costs on Advance II concerns not only the novelty of the IPI Policy, but developments in the insurance market generally in the period since the early development of the IPI Model and policy inception:

> *"The insurance world has changed a lot in the last ten years and the pricing that we agreed in principle ten years ago simply wasn't achievable. Corporate governance is now a much bigger issue than it used to be…* [but] *of course there's only one IPI product, isn't there? So there's no historical record, so the amount of capital that insurers would need to allocate to IPI these days is a lot higher than it used to be, and that all goes into the pricing as well."* (Insurance Broker)

> *"…we were working pretty hard and incurring quite a lot of expense getting legal advice and doing other work to try and get what was a novel concept off the ground. And the backdrop to this is that liquidated damages insurance was no longer written in the*

construction market. The consequences of Wembley Stadium failure were probably the thing that killed it…" (Insurer)

Unfamiliarity with the risks of insuring cost overrun in particular was also challenging for the insurers and underwriters. While details of the initial pricing proposals offered to the Alliance are not available, it is understood that the Alliance was reluctant to accept them, and further negotiation was undertaken at the end of February 2016 to settle on an acceptable Policy cost.

> *"…we always recognised that the first project is a demonstration project, we were going into the unknown as were insurers. And pricing was an issue…. And we were in a situation where the client wanted to go ahead with IPI but didn't really want to pay the premiums the insurers were asking. At the same time insurers were doing it almost as a favour ... So we had this tension of someone wanting it but not wanting to pay for it…* [but] *we got there…"* (Insurance Broker)

The negotiations leading to cost reduction included:

- Agreement by the Insurance Broker to waive the normal commission fee (c.£35k)
- Reduction in sums insured on the LDI policy (meaning the total premium was reduced by some £12k)

The insurance costs agreed were £254k (some 2.5% of project target cost, though excluding FIRA, TIRA and IF costs) including associated taxes. If taxes are excluded (and taxes were not explicitly provided for in the cost plan provision for IPI costs) the amount reduces to £227k. The amount also included insurers' extraordinary development costs of some £40k (excluding taxes) to cover the technical and legal costs of developing this novel policy and assessing likely risk, and that are unlikely to be required on further, similar policies. Note that taxes and development costs together account for some £67k (some 61%) of the additional insurance costs of £109k compared to the earlier cost plan provision.

Those interviewed generally felt that, while insurance costs were perhaps inevitably going to be high for the first use of IPI, they would not always be so as IPI becomes established and builds up something of a claims history. Recognising that potential users of IPI would always want some initial indication of the likely policy level, the insurance broker nonetheless cautioned against quoting a simplified, all-in rate:

> *"…going forward premiums need to be at a lower level. But having been through it once they* [insurers] *are comfortable now, I know* [some of those involved in IPI development]*… are very keen on having a template, this is the policy wording and this is the cost. Insurers, by comparison are saying, we're the underwriters, we'll look at each*

project on its own individual merits, do not tie us down to a certain premium." (Insurance Broker)

Use on Advance II

The IPI Policy is intended to perform a dual function (see Part 1 above). Directly, it aims to insure the design and construction team (IPT) as a virtual company in an Alliance with the client for a range of risks and liabilities, including time and cost overrun. More indirectly, it is intended to support collaborative working between project participants, encouraging them to work together to develop shared solutions on a 'best for project' basis. The accompanying *WP39* report provides a detailed analysis of its use on Advance II, drawing heavily on the views of Alliance Members, the IF, the insurers and brokers. In summary:

- The financial loss cover provided by the policy (essentially providing a high degree of cost certainty up to the Insurer's cap) was a key factor in the client's decision to adopt the IPI Model
- The policy was considered by all interviewees as providing crucial support to collaborative working within the Alliance, by tying together all the risks and liabilities of the Alliance as a single entity and at the same time limiting exposure to the risk of cost overrun
- Once incepted, the policy was not consulted regularly or extensively by the Alliance, though its 'no-fault' provisions were referred to from time to time by the IF to help remind Alliance Members of their commitment to each other to collaborate in a 'no-blame' environment
- The policy was viewed as an integral part of a wider set of arrangements that included the Alliance Contract, the Gain/Pain Share Mechanism, and IF facilitation
- Despite the cost overrun (see Part 4), the policy cover has not been invoked, and there is no evidence to suggest any questioning of policy provisions or challenges to the nature of the cover provided.

Reflections on the use of the policy on Advance II by key participants have identified a number of (relatively minor) areas for improvement, including:

- Pricing – the Policy premium and associated costs and charges were higher on Advance II than originally anticipated, reflecting its novel nature and the lack of commercial and claims history. All the participants believed that IPI policy premiums are likely to reduce on future projects and this will require brokers, insurers, underwriters, clients and potential Alliance members working closely together to develop a shared understanding of risks on a project-by-project basis.

- TIRA and FIRA arrangements – the role of the FIRA in particular is somewhat unusual in the insurance market and needs further development, including in relation to a potential loss adjusting role (see next point below) should a claim against the policy arise. The TIRA and FIRA were not novated to the insurer on Advance II. That decision was justified by the insurers who believed that arrangements prior to Policy Inception appeared to be working well and saw no need to change them. IPI Guidance has now been revised to omit novation of TIRA and FIRA appointments, the preferred approach being to appoint the TIRA and FIRA as subconsultants to the IF under a Deed covering IF, TIRA and FIRA. The intention is to provide a measure of coordination of the work of these specialist whilst maintaining their independent expert status.
- Loss adjusting arrangements – arrangements for loss adjusting process in the event of a claim need to be considered, including the (potential) role of the FIRA in the process.
- Policy cover and the operation of the excess – clarification is needed about the treatment of multiple small claims in the 'all risks' section and their impact on the policy excess and potential painshare. This is covered in detail in the *Work Package 39* report.

The operation of the Gain/Pain Share Mechanism provides a sharp reminder that simply providing financial loss cover via the IPI Policy does not remove responsibility from the Alliance to achieve – and hopefully improve on – the project target cost. The IF noted:

> *"… it's not a case of if there's a pain share IPI would have failed, it won't have failed at all. We won't have made a claim on the insurance, and the team will have learnt, everybody will have learnt that you've got to manage this project effectively otherwise pain share is real."* (IF, August 2017)

And further, in a reminder that the policy is part of an overall approach focused on improving the value of collaborative working, the insurer noted:

> *"I think it's … the balance of the merits of the outcome based on collaboration. That's miles more important than the backstop I think. …yeah, that's the crux of it."* (Insurer)

Project Bank Account/Payment Mechanism

Introduction

The IPI Model envisages the establishment of a Project Bank Account (PBA) during the Align/Prepare steps in Phase 1 (see Part 2 above). The Alliance Contract provides for the establishment of a PBA shortly following contract execution:

> *"An Alliance member opens a project bank account on behalf of the Alliance no later than 14 days after the Contract Date"* (Alliance Contract Clause 3.1.2)

A Project Bank Account (PBA) may be defined as '*a ring-fenced bank account from which payments are made directly and simultaneously by a client to members of his supply chain*' (Cabinet Office, 2012). The aim of PBAs within the IPI Model is to ensure that all key supply participants – not only Alliance Members but also those not formally part of the Alliance but contracted by Members for specific elements of the work (eg subcontractors at Tier 2) – are all paid at the same time for work done in accordance with the contract. By expediting payment through the supply chain in this way, the PBA is intended to reinforce principles of fairness and equity that underpin the IPI Model and help support collaborative working among all key suppliers, whether formally members of the Alliance/IPT or not. Additionally, the PBA offers a degree of protection in the event of insolvency of individual parties, as project funds are held in trust for the beneficiaries, banked centrally and flow directly to final recipients rather than via contracting/subcontracting tiers.

To support the Action Research approach on this project, guidance on PBAs was developed by the InnovateUK Research Consortium (led by the University of Reading) at an early stage in the research to be made available to the project eventually selected to trial the IPI Model to help participants understand the benefits and potential operation of a PBA. That guidance is included in the accompanying InnovateUK research reports: *Work Package 11: A quick guide to PBAs* and *Work Package 11a: Review of the Current Use of Project Bank Accounts (PBA)* – both by the University of Reading. It draws on generally available guidance (eg Cabinet Office, 2012) as well as the experience of the InnovateUK Consortium members. It was developed to help address the concerns of potential Alliance Members that may not have worked under a PBA in the past. Although prepared prior to the involvement of Dudley College in the IPI trial, the guidance was made available to the Advance II IPT.

Development of the Advance II Project Bank Account

A further InnovateUK research report *Work Package 26: Report on Project Bank Account (PBA) utilisation and effectiveness* (University of Reading) summarises progress with the development

of a PBA for Advance II at May 2016. While a good deal of work was done in establishing the framework for an Advance II PBA – including the development of a formal 'deed of agreement' that would govern the operation of the PBA for all parties to it – the PBA was never formally established for the project. This is partly because of changes in the client's banking general arrangements during the project combined with delays in securing a banking provider that had an established relationship with one of the parties (see below). The following provides a summary of key developments.

PBA arrangements: the Deed of Agreement

A sample PBA 'Deed of Agreement' forms part of the Alliance Contract included in the ITT for Advance II. A more detailed Trust Deed based on a model form developed by Barclays Bank during early discussions with the Cabinet Office was developed by IPI Initiatives during 2015 (as discussions with potential banking providers were progressing – see below) specifically for an Alliance structure. The resultant Advance II project Trust Deed is included as an appendix to the *WP26* report. The Deed covers how the PBA will work – having two account holders, typically the client and Alliance Manger who arrange for payments into the account in accordance with the Alliance Contract for onward distribution to relevant parties – and details the PBA beneficiaries. Its key features include provision for:

- The inclusion of 'named suppliers' as beneficiaries, who are engaged by the Alliance Members to carry out elements of the works but are not Alliance Members, to be paid directly from the PBA at the same time as the Members
- Insurers to pay any successful claim under the financial loss policy directly into the PBA for onward distribution to beneficiaries in agreed shares (so such payment does not go back to the client directly).
- All monies in the PBA to be held on trust for the beneficiaries.

The search for a banking provider

The PBA concept was initially explained to Dudley College in a presentation by Rudi Klein, Chief Executive of Specialist Engineering Contractors (SEC) Group**,** at a meeting in January 2015, outlining the UK government's commitment to using PBA on construction projects and the benefits to all parties. The College agreed to progress the development of PBA arrangements for Advance II and instructed IPInitiatives to develop arrangements (including the Deed of Agreement – see above) and identify potential banking partners. A number of potential banking providers were approached, and one of the client's existing banking partners (Barclays) was identified as the preferred provider. Negotiations progressed with Barclays on establishing a PBA for Advance II prior to, and immediately following contract execution in May 2015, but later that

summer the client decided to renew its banking arrangements more generally and discussions with Barclays were halted.

Alternative providers were identified and approached and, by September 2015, a number had expressed interest, noting that they ideally wanted one of the beneficiaries of the PBA to be an existing client. One of the Alliance Members was an existing customer of Lloyds, one of the potential providers, and the Alliance Board approved the development of a PBA with Lloyds. Discussions progressed during October 2015; however it emerged that the Member's parent company preferred the establishment of an escrow account rather than a PBA and, as this could not be resolved quickly, the Alliance agreed to investigate other providers. By November another banking provider (Santander) had been identified having an existing relationship with an Alliance Member, and discussions commenced with a view to establishing a PBA.

Early in 2016, as the Trust Deed to govern the operation of the PBA was being finalised by IPInitiatives (see below) the client became a customer of Santander, transferring some of its banking business to this new provider. At that time, the intention of the Alliance was to have the PBA in place following policy inception and the start of Phase 2. However, while the Deed of Agreement was ready for signature in February, the transfer of important elements of banking business by the client to its new provider was more of a priority, and the finalisation of PBA arrangements were further delayed. By May 2016, Santander had put in place arrangements for a PBA and these were submitted to the client for approval. As the project was part-funded by the Local Authority and a Local Enterprise Partnership (LEP), further approval was required for the use of a PBA on the project. By that stage, the client's arrangements for paying Alliance Members directly for Phase 1 work had already been established for Phase 2 and were believed to be working well, and no further action was taken.

Comments on attempts to establish a PBA

The establishment of a PBA took considerably more time than was anticipated on Advance II. This is due to a number of factors, including the lack of a prior formal agreement covering an alliance (the Deed of Agreement); the lack of prior experience of the client and Alliance Members; and also a reluctance on the part of some banking providers (including the parent company of one of the Members) to enter into such an arrangement, the bankers preferring to deal with existing customers. The change in the client's banking provider during the project was also significant, as was the need for funders' approval. The IF reflected that, for future projects, there could be more awareness of which Alliance partner would potentially be best suited to push forward PBA arrangements on behalf of the project (e.g. do they have previous knowledge of PBAs? Would their financial advisors/departments be prepared to establish one?). A prior list of

banks willing and able to provide PBAs would also be helpful, and avoid the need to research the market and establish banks' particular requirements and conditions. The point is returned to in Part 8: *Lessons learned and recommendations for improvement*, below

PART 7: IPI ON ADVANCE II – HOW THE PROCESS WORKED

Collaboration and teamwork

Introduction

An essential purpose of the IPI Model is to exploit the potential for collaboration that exists in design and construction teams, and further to channel that potential to deliver improved project outcomes. The key features of the approach are all designed to support improved collaborative working. These include the creation of a formal Alliance embracing collaborative working principles, including agreements between the parties to make decisions on a 'best for project' basis and to avoid taking action against each other should problems arise. They also include the engagement of the Alliance through processes of 'cultural and commercial alignment'; the sharing of risk and reward (Gain/Pain) among Alliance Members; joint development of a project cost plan and agreement on a Target Outturn Cost and Target Completion Date; and insurance arrangements for the Alliance as a virtual company covering key project outcomes – including time and cost overrun – on a 'no-fault' basis under a single policy. For the client, opting to adopt an untested IPI Model for the first time, the extent to which the Policy tied together the risks and liabilities of the Alliance as a single entity was seen as crucial in helping to ensure that the team worked collaboratively:

> *"The process and the policy itself we wanted to go with, as it seemed to give us the opportunity to improve collaboration in working to develop a product. There should, by virtue of that, be some efficiencies in process and time and non-duplication of work and this type of thing, and we were hoping it would give us, as a client obviously, which is where our focus is likely to be coming from, more cost certainties to what the eventual cost of the project would be at the end."* (Client).

Others involved reflected on problems of conflict and adversarialism that arise in construction contracts more generally, believing that the IPI Model – and the insurance policy that underpins it – would help avoid these:

> *"So, yeah, collaboration was top of the list of reasons why one thought this would work. … I'm not just saying that. … you can see where there were problems in the construction sector, where it's so adversarial, but that's where challenges exist. If you can review that you can see that there would be a different outcome and something that we could manage."* (Insurer)

Insuring time and cost overrun and effectively limiting the client's (and Alliance's) liability to the 'painshare' in the Gain/Pain Mechanism (and any additional overrun over the £2m sum insured) is clearly potentially attractive to clients and their Alliance partners. But by removing a significant element of risk that would otherwise be present, the Policy is also intended to encourage participants to work more closely together on a 'best-for-project' basis, less burdened by anxiety about fault or failure:

> *"OK, so for me the key objective is to unlock the value of integrated collaborative working by removing the blame and liability culture which we have from fragmented insurances and contracts everywhere else, so that's it for me."* (IF)

Considering collaboration and teamwork

Assessing the extent and possible effectiveness of collaboration on Advance II is not straightforward. This is partly because collaboration and related topics of teamworking and integration in building design and construction are complex and not easily amenable to clear identification and assessment. Two approaches are adopted in this review:

- The first is to consider the work of the Alliance in terms of the FUSION principles (see Part 5) for collaborative working adopted specifically by the Alliance Board, at the suggestion of the IF, and incorporated into the Alliance Contract.
- The second is to undertake a short review in terms of a more widely recognised collaborative working framework – in this case that published by Constructing Excellence (Eclipse Consultants, 2004 - see further below) – to provide a more external and arguably more 'independent' perspective.

The evidence for these reviews of collaboration on Advance II is drawn from three key sources:

- from the documented reports of the Independent Facilitator (IF) to the Client; recall that the IF's brief included encouraging collaborative working among Alliance Members – see Parts 4 and 5. One of the roles of the IF is to provide regular reports to the client, insurers/underwriters on the extent and value of collaborative working on the project.
- from the observations of the University of Reading researcher, who was present during many IPT and Alliance meetings from May 2015 through to project handover in August 2017 – see Part 3.
- and from the participants' own accounts, captured in semi-structured interviews, of their experiences of collaborative working on Advance II – see Part 3.

In considering collaboration in terms of the Constructing Excellence framework, particular reliance was placed on interview data. Those interviewed for this report were unanimous in their

views that the IPI Model was instrumental in achieving a high degree of collaboration among project participants (the IPT/Alliance members in particular) on Advance II, compared to what they experienced on other construction projects more generally. Further, they believed that the extent of collaboration between team members was of considerable value to project outcomes in a number of ways:

- Fundamentally, in developing innovative solutions to design problems and, in many cases, exceeding some of the key requirements in the strategic brief (see Part 4 above, and also the next section: *Innovations*)
- In maintaining project momentum and progress, and seeking to avoid delay rather than using problems arising as opportunities to argue for further time (though note the discussion of time issues in Part 4)
- And generally in working on a 'best-for-project' basis, putting the interests of the project before those of their respective businesses.

Collaboration and teamwork on Advance II – the FUSION Principles

Early stage IF reporting – Phase 1

Consistently, the IF reports to the client during the early stages of commercial alignment and design development (Phase 1) noted the good working relations and effective communication being established within the Alliance. This was provided in a qualitative commentary on 'team collaborative working', which also highlighted (though in general terms) observed departures from desired ways of working. For example, the IF report for November 2015, when the project was nearing the completion of Phase 1, noted:

> "*The team at Advance II has progressed well and there are no organisations or individuals that are considered unable to make the necessary transition* [to collaborative working under the IPI Model] *and indeed some have already moved further than might have been expected from initial observations. … occasionally, as might be expected, behaviours based on traditional experiences, methods and procedures surface and need to be addressed; this is one of the key roles of the IF. Similarly the key suppliers for groundworks, frame and façade are exhibiting a good understanding of the opportunity and the different part they will be playing and are considered to be suitable to be named suppliers. They have already impacted on design solutions that are best for project*." (IF Report, November 2015)

IF Reporting during detailed design and construction - Phase 2

Following Policy Inception and throughout Phase 2 the IF reported generally monthly to both the client and insurers. Unlike earlier reports, these provided a more explicit commentary on

collaborative working against each of the six FUSION principles, and provide valuable insights into the extent to which the Alliance, IPT and wider project teams (including suppliers and subcontractors not formally part of the Alliance) adapted their working practices over the course of the project.

Selected extracts from a series of these reports are presented in Appendix 7, covering the period June 2016 to July 2017. As with earlier reports, the commentary is qualitative; at times it provides a general overview of team working and collaboration, while at others it focuses on more specific issues and potential problems arising. Overall, the account across all reports reflects a generally positive assessment of the extent of effective teamwork and collaboration against each FUSION principle. It is evident, that particularly in the later stages of Phase 2 as the target cost and completion dates came under threat, collaborative relationships were subject to increasing pressure. However, the strong collaborative environment developed in the early stages of the project prevailed throughout, and there is no evidence that this was significantly weakened through the activities leading to project completion. One particular challenges that needed to be addressed on an ongoing basis was the integration of non-Alliance suppliers and subcontractors (as well as site-based personnel more generally) into the collaborative environment shared by the Alliance and IPT. This is also discussed further below under *Innovations – project organisation, design performance and project delivery*, with some specific recommendations for improvement identified in Part 8 of this report.

In summary, the extent of collaborative reported on by the IF against key FUSION principles is as follows (further details are provided in Appendix 7):

- Fairness – this emerges as a strong feature of the project environment on Advance II, with the Alliance and IPT in particular demonstrating fairness and inclusivity, though some Members were observed to embrace the related behaviours more than others
- Unity – while there is evidence of the development of shared goals and consensus building among Alliance and IPT Members (see also next section), the engagement of suppliers and subcontractors – and their site-based teams – in this principle in particular remained a challenge throughout the later stages of Phase 2
- Seamless – the IF reported initial challenges arising in the Alliance and IPT in Phase 2 relating to the emergence of 'traditional' attitudes, with stronger evidence emerging later of more willingness to work on a 'best for project basis'
- Innovative – the extent to which many aspects of the project – not just design/building performance issues, but including management and delivery processes as well – were innovative and developed in a collaborative environment is a noteworthy feature of the IF

reports, and it discussed further below in this Part of the report under *Innovations – project organisation, design performance and project delivery*

- Open – again, as with the Fairness and Unity concepts, the IF reported a high degree of openness and 'honesty' in how members of the Alliance and IPT dealt with each other, though with ongoing concerns about the extent to which the site-based team did not always share fully in these approaches
- No Blame – interestingly, the IF concludes (in the final IF report of July 2017 – see Appendix 7) that the requirement in the Alliance Contract for a 'no-blame' approach has helped drive the required behaviour, although Alliance and IPT Members should still be accountable for performance, including mistakes, especially on matters where the risk falls on the Alliance as a whole.

Of course, the role of the IF was focused explicitly on developing and encouraging collaboration among team members, and the reports of performance in terms of the FUSION principles should be viewed in the context of ongoing efforts to improve collaborative working. Additionally, and following Policy Inception in particular, IF reports were provided to insurers also. One of the insurers commented on the value of this communication on Advance II as an 'open exchange':

> *"… lots of good collaborative feedback was happening and we had regular meetings with IPI here and they were giving us feedback on how the collaboration process was working, going through some of the challenges …personnel and that sort of thing, how that changed."* (Insurer)

Collaboration and teamwork on Advance II – a Constructing Excellence perspective

A framework for assessment

As noted in the introduction to this part of the report, assessing the extent of collaborative working is challenging, partly because concepts of collaboration and teamworking are complex and not easily amenable to clear identification and assessment. Perhaps because of this, these concepts have attracted a good deal of research attention for quite some time, and there is now an extensive literature covering a variety of aspects, including team formation (Raiden et al, 2004); training and motivation (eg Tabassi et al, 2012); performance (eg Tuuli et al, 2012); conflict resolution and trust (eg Buvik and Tvedt, 2017); and leadership (eg Kissi et al, 2012)). In recent years the focus of collaboration studies in construction has seen a shift towards consideration of how the adoption of BIM supports and facilitates improved collaboration (Lu et al, 2013), amongst other issues. While a comprehensive review is beyond the scope of this report, it may be noted that, despite all this attention, no clear model of collaboration/teamworking has emerged as

particularly effective or desirable in construction. Instead, a wide range of 'principles' derived from experiences of partnering and alliancing (see, for example, Chan et al, 2004; Anvuur and Kumaraswamy, 2007) tend to feature prominently in published 'good practice' guidance on teamworking and collaboration, such as that from the (former) UK Office of Government Commerce (OGC, 2007) and Constructing Excellence (Eclipse Research Consultants, 2004). Whilst not explicitly acknowledged in the IPI Guidance (IPInitiatives, 2014), the IPI Model draws on these principles – particularly on those in the Constructing Excellence guidance – and they thus provide the basis for a consideration of collaboration and teamwork on Advance II. This helps provide an additional perspective to that derived from the review against FUSION principles undertaken by the IF on the project.

The teamwork principles in the Constructing Excellence guidance identify many pre-conditions for effective teamwork, including the need for:

- a team 'identity', whereby the team accepts joint responsibility for achieving project outcomes
- a 'shared vision' of the project objectives and desired outcome developed collaboratively and regularly reviewed by team members
- open communication and active knowledge sharing among team members
- a deliberate focus on collaboration and participative engagement in an environment of mutual trust, openness and respect
- arrangements for issue negotiation and resolution through risk sharing
- arrangements for reflection and self-assessment by team members.

A 'teamworking matrix' for the assessment of teamwork against notional 'best practice' is provided in the Constructing Excellence guidance and a copy is included in Appendix 8. It is not the intention to provide a formal assessment of collaboration on Advance II against this matrix, primarily because the IPI Model did not set out explicitly to adopt it. However, it provides a potentially useful, if somewhat broad framework to enable key aspects of collaboration to be considered.

Team identity

Establishing a clear team identity and a shared vision of project goals early in the process was key to building a collaborative environment on Advance II. Part 5 above describes the arrangements for the selection of Alliance Members and the assessment of their suitability for collaborative working through the procurement process. These also included the process of 'cultural alignment' (involving team-building workshops) following selection, designed to help ensure that the potential Alliance Members can work effectively together. The arrangements, from the early

stages of the procurement process through to contract execution were crucial in instilling a clear sense of team identity and project ownership among the Alliance. Further, the initial period of 'commercial alignment' – preceding execution of the Alliance Contract – provided a more explicit means by which the team began the process of accepting joint responsibility for achieving project outcomes, eventually agreeing their respective shares in positive or negative outcomes during Phase 1. This is also described in Parts 5 and 6 above.

In addition to the acceptance of joint responsibility for project delivery and successful outcomes by the project team, an important requirement in the Constructing Excellence guidance (Eclipse Consultants 2004) for Team Identity is that '*members hold each other accountable for delivering the solution…*' and '*come to place the good of the team before their own interests or ambitions, or those of their own organisation or discipline…*' (p12). The Alliance Contract, with its specific requirement for the parties to work collectively in a spirit of mutual trust and co-operation on a 'best for project basis', and having joint liabilities for project outcomes explicitly addresses these requirements. Additionally, the subrogation arrangements under the Contract – whereby Alliance members and their supply chains waive their normal rights to claim against each other in the event of fault (see Parts 2 and 6 above) – further reinforces the concept of Team Identity and joint responsibility. Of course, while the Contract was cited in IF reports as being particularly influential, it may not on its own be sufficient to encourage effective collaborative working:

> *"So if you force people to work together under a contract irrespective of what that contract is, there's always some degree of watching your back, because you're contractually forced to work together, not because you want to. Having said that, I believe the team on IPI, I think they genuinely did work very well together, although I still think some parties on the project … put more effort in to the whole process than other parties…"* (FIRA)

The IPI arrangements that are focused on team formation and the development of team 'identity' seek to address collaborative working in ways that are similar to approaches in other areas also, including in the area of 'partnering'. For example, the model of partnering and how it affects project performance in Anvuur and Kumaraswamy links similar aspects of team identity and good teamwork (cooperation, mutual support, improved productivity) to project outcomes (cost, quality, programme and innovation) (2007; Figure 1, p43).

Shared vision

The development of a shared vision of construction project outcomes is essentially the product of an effective synthesis of client need and construction (supply-side) ideas and capability. On Advance II, client need was expressed initially in the PQQ document (for the procurement of

Alliance Members - see Part 5) in the form of an outcome-focused strategic brief and prioritised success criteria (these are also covered in Part 4 above, and in Appendix 3). By not prescribing how these outcomes would be achieved, nor outlining potential technical solutions that would achieve them, a good deal of responsibility was transferred to the IPT members of the Alliance to develop their own, shared vision of the project and the means of delivering it. Of course the intention here is not solely about developing a shared vision of desired project outcomes, but also about using the ability of Alliance Members, collectively, to develop an effective and high value solution to key project challenges. Indeed, the latter supported the former on Advance II principally through the process of design development during mid-to-late 2015 leading to the agreement of the project Target Cost and the submission of the project for IPI Policy inception early in 2016 (see Parts 5 and 6). As noted in Part 5, this process took some time, though concluded with a design solution that was considered technically and financially viable (by the TIRA and FIRA respectively) and for which the main innovation proposals (relating principally to the heating, ventilation and cladding strategies) were well developed.

The longer than expected process of developing the design and agreeing the Target Cost may be partly explained by the focus on both performance *and* commercial matters that the IPI Model requires, particularly as all Alliance Members had a direct stake in commercial outcomes via the Gain/Pain Share Mechanism. Arguably, this helped to 'crystalise' their shared vision of the project in a highly specific way. Agreeing to submit a design for scrutiny by independent specialists (TIRA and FIRA) and insurers is strong evidence of ownership of the project solution by the Alliance and its confidence in achieving the agreed outcomes.

That said, many participants observed, on reflection, that commercial alignment was completed too early on Advance II before all of the risks had been properly considered (see Part 5 above). There is a sense that the strong, collaborative spirit developed in the early stages of team formation and design development encouraged the Alliance to be less conservative in their approach to project risk, exemplified by the agreement among most members to adopt equal Gain/Pain Shares (initially proposed during Commercial Alignment), regardless of their respective remuneration from the project.

> *"but there was a principled approach to, well we're all in this together so we'll all have the same percentage of pain/gain share, which I believe was a commercial mistake. ...I think the decision was made from a principle point of view trying to make the work that, not trying to spend ages going through commercial alignment before we could hammer out an agreement much like people are trying to do on Brexit, but in the long run now*

we've got to where we've got to with a pain share situation that it's bitten them a bit." (Client)

There is also evidence of the potential problems that can arise when a shared vision is not developed – especially within a context, such as that with IPI/Advance II that explicitly encourages it. It was noted in Part 4 above that, during a period of delay in confirming project funding, when the IPT was effectively stood down for a short period, the client requested further design development on façade/cladding options by the architect, leading to a solution that the client preferred. When the project recommenced the IPT seemed initially content to accept this – motivated by a desire to maintain the strong spirit of collaboration and risk sharing that had been established though the earlier cultural and commercial alignment processes:

> *"when the project was temporarily held for, trying to get the funding sorted out, it carried on,… here's an external façade design, which of course* [the client had] *seen it, he wanted it, even though it was unaffordable as far as the budget was concerned. Now what we didn't do, again hindsight, learning for everybody, we didn't say that's a Review Event that needs to be dealt on day one, that's what we should have done, and that's what we'll do in future."* (IF)

However, the development of the façade solution outside of the Alliance framework was viewed later, in terms of the Review Event, as a potentially contentious cause of cost overrun. The IPT believed that, because all Alliance Members had not been involved jointly in developing a preferred solution from the outset, and had not fully tested all the risk issues and other implications (see Part 4), they should not have to share in the additional costs involved. This is made clear in the review event documentation submitted to the client in July 2017. On reflection, most Alliance Members believed that this was one significant (albeit opportunistic, and not intentional) departure from the principle of joint development of project solutions. And while it led to initial disagreement between the IPT and the client over responsibility for the costs involved, it was eventually resolved in the settlement of final project costs (see Part 4).

Open communication and focus on collaboration

The emphasis on developing team identity and a shared vision of the project in the early stages of design development was seen by Alliance Members as helping to establish a working environment characterised by open communication and mutual co-operation between them.

> *"I've worked on projects previously* [that] *… I considered … relatively collaborative, because we were able to liaise with the employer and we'd all sit around the table together and bounce off one another. However I think IPI takes it to the next level really. …and that for me is one of the fantastic things about the process was how open everybody*

was. There were some very frank conversations at times happening that you would never normally be party to or hear …. I think it's certainly achieved the openness and the honesty." (Building Services Engineer)

"Everyone felt they had a voice. And there was a lot of direct communication between some contract trades. And everyone seemed to know everybody around the project. There was great collaboration between trades, keenness to solve issues, when a problem cropped up there wasn't a huge amount of, you cocked that up [so] *put it right so I can do so and so, there was a lot of focus on everyone trying to find an issue, a solution to an issue as quickly as possible and that sort o, collective ownership of group solutions focused on overall objectives, the bigger picture, and there was no, no culture of producing extras to resolve an issue. And it was a, bearing in mind as someone putting it as this, considerate structures project it was quite considerately stunning."* (Constructor at Lessons Learned Workshop, August 2017)

Some observed on the extent to which observance of the need to work collaboratively – perhaps reinforced by an adherence to the values implied in the 'Fusion' principles (see above) – constrained direct communication when this was required:

"This is the problem of people walking into what they perceive is a [collaborative] *working environment, believing that they need to be nice and friendly to everybody when actually true collaboration is being open and honest and sometimes a bit brutal and hard …* [Normally] *I have to be contractually nice or unpleasant depending on my role. Suddenly I'm free to actually work as a normal human being. I don't want to say nasty things to people and yet actually if someone's messing you around you … you should be saying: 'sorry we can't behave like that'. So we found the problem all the way through … and as new people arrived, dropping back to this 'don't want to say anything unpleasant to each other' and in the end this is open and honest and realistic and it needs, you know it needs occasionally someone to call the kettle black if the kettle's black, you know simple as that."* (Constructor at Lessons Learned Workshop, August 2017)

As the project progressed, more formal arrangements were developed to support this working environment. The adoption of BIM (see further under *The adoption of BIM* below) in particular for design development and for the management and exchange of project information throughout the process is an important element in collaborative working on Advance II. Additionally, the management arrangements – and in particular the Project Working Groups and 'Trinities' (See Part 5) – placed a strong emphasis on communication and the development of understanding of the different perspectives (principally design/performance, delivery/programme and cost) by

Alliance Members. And while these arrangements were viewed positively by Alliance Members, there were (perhaps inevitable) strains as the IPT accelerated work in the closing stages to complete the project:

> *"…it was a real good structure almost for everyone to get round, but again as soon as you put a load of people up against it, pressure, doing what they do day to day building and designing a building, all that stuff kind of goes out the window because everyone's panicking, everyone's overworked and under pressure and they all revert to type. So for me the Trinity was a great concept that wasn't properly implemented …, you know that close knit collaboration that was really required wasn't really there."* (Architect/BIM Manager)

Additionally, there is a sense from some Members' accounts that, at times, the importance given to communication and the need for collaboration around jointly-developed solutions got in the way of progress. While discussions at project meetings were inclusive and informative, they sometimes lacked leadership, drive and an effective resolution of the issues being discussed, reinforcing the observations of this issue noted in Part 5 above…

> *"It's almost like delivery by committee, so if the Alliance board is around and there will be a problem, ordinarily we'd go away and solve the problem. Well we go and solve it, somebody else goes away and solves it, somebody else, and they all get round the table and talk about it. And you don't need that many problems. Now you could argue that actually that's collaboration, but instead of getting a better outcome, we seem to get the same outcome, but it just takes longer."* (Architect)

> *"Yeah, but there was a reticence all the way through, nobody wanted to be the bad boy, and it was… the 'collaborative conundrum', in that a reticence to make decisions but they didn't work, and I think you'd try and train them more into being the board. They were all trying to manage and the board meetings weren't board meetings, they were more IPT type meetings, quite often."* (IF)

This is consistent with observations made more generally about the IPI Model, as well as about aspects of the management arrangements, particularly those relating to how the Alliance worked as an effective decision-making entity (see Parts 5 and 6 above, on questions of leadership). The sense that, by placing perhaps too much emphasis on collaboration and collective decision-making, many of the formal management groups – including the Alliance Board – tended towards discussion rather more than decision runs through a good deal of Members' reflections on this issue:

"So we call this a collaborative project because they're all working together as a team' they felt you shouldn't be saying to people: 'you haven't done this, and you haven't done that'. So there was too little checking and stopping of each other." (IF)

"No-one wants to be the one that imposes their will and be accused of not being collaborative so I can understand why it's happened. But somewhere in the structure of IPI there needs to be some sort of thing that says ultimately this person has the say. That's perhaps the bit that's missing." (Observer from the InnovateUK research consortium)

On Advance II, both the leadership role of the Alliance Manager and the strategic function of the Alliance Board have been identified as aspects to improve in the future use of the IPI Model; recommendations in respect of these aspects are developed in Part 8 below. The Project Coordinator, commenting specifically on the appointment of a Client's consultant as the Alliance Manager who was not formally part of the Alliance noted:

"Because they're all drilled so hard into being collaborative they're not managing the Board… I think the behaviour focus caused a weak team leadership and no direction, and direction as in Director, capital D, for this behaviour." (Project Coordinator)

The extent to which Advance II was not simply a 'trial' of a new process but a project environment within which the IPT/Alliance and the IF had to 'work-out' a new process as the project developed is also relevant here. This was reflected on by many Members:

"There was a, to some extent there was almost a lack of, I won't say collaboration, a lack of coordination, as to who was doing what and what process was supposed to be followed because there weren't any laid down processes. And what it meant was once we'd gathered that, well we're drifting a little bit here because nobody's got a set process, as you do under traditional methodologies, we had to pretty much sit down and write our own." (Client)

However, there are many positive examples of how the IPT in particular worked collaboratively to achieve project improvements and resolve challenges arising. Commenting on how environmental services innovations in particular were achieved, the Project Coordinator reviewed how the daylight and thermal analysis needed to be integrated with the façade and services design and installation involving input from the Architect, Strategic Engineering Services Consultant, and MEP contractor:

But we were able to without any commercial barriers, … [On this project] *as a designer you're not trying to protect your own view, there's nothing stopping you having a*

discussion and veering into helping the architect do that. Nobody's going to question that you've spent the man hours doing it because it's an integrated [process], *a lot more effective. …we wouldn't have the building we've got, …under a traditional contract, I don't think we would, not for a building this scale, that would have been really, really difficult, really difficult."* (Project Coordinator)

Collaborative working extended also to the resolution of unforeseen challenges. Towards the end of the project in July 2017, as the IPT worked to complete outstanding aspects, queries were raised by the Approved Building Inspector in relation to concerns about the fire safety of a cladding detail. The IPT believed that the particular concern would not have arisen prior to the recent Grenfell fire disaster in London in June[15] but that, in the considerably more risk-averse inspection environment post-Grenfell, the team had to respond:

"… after the Grenfell issue there was a team wide response as to how we believe we'd not got an issue as a result of Grenfell. Now whether that would have happened quite so quickly and openly if we'd have had an individual designer, an individual contractor, and a supplier as it were, I'm not sure if I'm perfectly honest. It isn't even something I had to instigate myself, I turned up to the meeting and it was already something they'd got in hand …. And it was a joint statement from the contractor, the installer, and the architect." (Client)

The extent to which collaboration encouraged team members to focus on the needs of the project rather than their own organisations' needs was also noted by all Alliance Members. The Insurance Broker set this in the context of more typical team behaviour on construction projects when problems arise:

"There were challenges but rather than the team diverging when the challenges came along, they actually came together to create engineering solutions, and I use that phrase loosely, to engineering problems rather than legal solutions to engineering problems. And again, I think that's a really important distinction. We handle about 1,000 PI claims each year and it's not a good experience…. Now at exactly the time when the client needs help, the team have walked away, and that's our fault as well because if clients come to us and say, there's a problem on site, we always say, back off, look at your contract, look at your brief, don't be helpful because it might backfire. And if we're saying that to our clients, other brokers will be saying it to their clients and the team just falls apart." (Insurance Broker)

[15] See the Grenfell Tower public enquiry website at https://www.grenfelltowerinquiry.org.uk/

Arrangements for issue resolution

Essentially, arrangements for the resolution of any disagreements between Alliance Members are provided for within the Alliance Contract, containing a clear preference for 'amicable resolution':

> *"The Alliance Members resolve all disputes between them amicably and expeditiously making use of the skills and services of the independent facilitator and independent risk assurers and, where appropriate, suitable third party mediators."* (Alliance Contract, Edn 1 Rev 2, 2017, clause 9.1)

The Contract also makes clear provision for Adjudication under the *Construction Scheme*[16], which provides a range of statutory rights and obligations in relation to adjudication. It also provides for disputes specifically in relation to differences between the Target Outturn Cost and the Final Outturn Cost to be the subject of 'expert determination', ie to be referred to an agreed third party expert to determine the issue. In this role the expert acts in a mainly technical capacity and not as an arbitrator between the parties.

The approach to the resolution of issues arising on Advance II was consistently to follow the 'amicable resolution' route, though this was perhaps more in the collaborative spirit engendered on the contract rather than via explicit reference to the Contract. As the IF noted, commenting specifically on the need for a Review Event in relation to potential cost and time overrun issues:

> *"But again we were trying to get a grip around this new process and everybody was confident it'd all be all right.* [X] *should have advised them that that's a review event, it shouldn't have happened and we should have agreed what we were going to do about it…. And as a result we're in* [a] *pain situation at the end where it didn't get resolved earlier on, it wasn't nipped in the bud,* [though] *it's not nearly as bad as a traditional project. We haven't got any of the people* [who] *have stopped working and …blaming each other that you normally get on a …project like that. Because what they've carried on doing is saying, well actually we're all in this together."* (IF)

Again, the IF underlined the role of the contract in supporting collaborative working: *" they regularly say, we're all in this together, and that comes from the joint environment that's created by the alliance contract and the IPI insurance."* The Insurance Broker agreed, noting also that the risk/reward (Gain/Pain share) element of the IPI Model provides a strong motivation for Alliance Members to work together:

[16] The Scheme for Construction Contracts (England and Wales) Regulations 1998. See http://www.legislation.gov.uk/uksi/1998/649/contents/made

"The way in which the construction contract is put in place, no one wins unless they all win, and if anyone loses they all lose. Whereas had it been JCT, for example, I can just imagine some of the games that would have been played, that maybe one of the subcontractors or the contractors have said, OK there's a problem over there that's caused me a loss over here, so I want money. Well under IPI that can't work. What it does, and I think that this is really powerful, is it aligns the interest of the team, including the client, not only when things go well but when things go slightly bad as well, because they're sharing a loss up to the pain share cap and they're not talking about liability, it's loss not liability. And I think that's a really important distinction, it really is." (Insurance Broker).

The Adjudication or Determination clauses in the Contract were not invoked on Advance II, and there is no evidence to suggest that these were considered as a possible means of resolving differences of view among Alliance Members during the project.

Arrangements for reflection and self-assessment

The extent of facilitation of the IPI Model, from the formation of the Alliance through the early design stages and on to on-site construction and completion (Part 5 above) provided considerable opportunities for reflection by Alliance Members, both on aspects of design and construction that could be improved, as well as on aspects of the project process and Members' roles in it. Additionally, the Action Research approach adopted provided further opportunities through the managed cycle of diagnosis, action planning, reflection and adjustment (see Part 3 above). Together, these processes allowed the identification and capture of ideas for improving the IPI Model, many of which are developed in Part 8 below.

Innovations - project organization, building performance and project delivery

Innovation on Advance II

Through the adoption of the IPI Model, Advance II became a host project for a range of innovations, not only in terms of building design and technology, but in terms of organisation and process as well. The establishment of a project Alliance under an Alliance Contract and supported by innovative insurance arrangements was intended to create a collaborative environment to open up the potential for fresh thinking and exploration of new ideas, free from concerns about individual Member liability and fault. The IPI Model seeks to exploit this potential by actively encouraging innovation on a 'best for project' basis, focused on project outcomes and on meeting client needs. In these terms, innovation in process and practice under

the IPI Model is intended – through knowledge sharing and inter-disciplinary cooperation between parties in a the collaborative environment – to lead to innovation in design, construction, technology application and performance. It is convenient, therefore to group the considerable range of innovation introduced on Advance II into distinct categories, covering:

- project organisation and management
- design and building performance
- project delivery

These different types of innovation will be reviewed in turn in this section of the report. As noted, innovations across these different categories were often closely related and interdependent. For example, Work Package Trinities (an organizational innovation) helped to develop an engineered natural ventilation solution (a design and building performance innovation) that was supported through construction via 'Build in a Day' workshops (a delivery innovation). Comments provided by interviewed Alliance personnel clarify the effectiveness of the various innovations on the project and highlight the problematic and advantageous issues surrounding their use.

Project Organisation and Management Innovations

The project organisation and management innovations on Advance II were explicitly designed to foster collaborative working, engender equality and build a team ethos amongst Alliance Members so that better outcomes could be achieved for the client. However, some of these innovations were believed by participants to have worked more effectively than others; the process of formulating, agreeing and then establishing the new arrangements taking considerable time and effort, with consequent impacts on people and resource costs, as well as the project programme. Moreover, the introduction of new organisation and management arrangements was no simple matter: Alliance personnel would sometimes revert to familiar working practices when under pressure to meet deadlines, neglecting the new organisational arrangements. Such instances highlight again the importance of ongoing facilitation (see Part 5) as well as clear and authoritative leadership on a project introducing considerably new processes and practices.

Part 5 of this report details the various managerial roles and responsibilities on Advance II (i.e. the Alliance Board; Alliance Manager; Project Coordinator; Integrated Project Team; Project Working Groups) and provides participants' comments on their development and effectiveness. The key issues arising from this discussion are captured below in terms of the performance of these new organisational structures and their impact on working practices.

Organisational Structures & Roles

With the formation of the Alliance, a new 'virtual' organisational entity was created for the project, which had responsibilities in terms of project delivery together with obligations and liabilities that were underwritten by the IPI Policy. This central organisational innovation required new structures and roles for it to work effectively, and many of these were either developed from the principles identified in the IPI guidance (in the case of Alliance working arrangements), or developed afresh (in the case of the Project Coordinator role – see Part 5) to suit the specific context of Advance II. Regardless, these new arrangements demanded fresh thinking and perspectives from Alliance Members in particular and, in general, were believed to have worked well. The Alliance Board, as the primary governing entity, was representative of the Alliance Members, was engaged in the project (at times, perhaps too much so – see below) and discharged its decision-making function effectively. As noted in Part 5, the Board tended at times to be more operational and less strategic in its focus, and became involved in many technical aspects of design and construction that were more the responsibility of the IPT. Additionally, Alliance management arrangements were perhaps over-complicated by the appointment of a non-Alliance Member as Manager. While the Project Coordinator role provided an effective interface between the Alliance and the IPT, participants generally believe that these arrangements took some time to work through on Advance II, and that the project would have benefitted from clearer governance arrangements and role distinctions during Commercial Alignment. Overall, a lack of leadership and 'drive' was seen to characterise many of the governance and organisational arrangements on Advance II, a consequence perhaps of a very high level of support developed on the project for collaborative working and collective decision making.

The various project Working Groups, each consisting of activity/task-focused personnel from Alliance Members, were also seen to be an effective way of dealing with design development and construction in specific areas and work packages. These also varied in performance, and it is again noteworthy that some of the weaknesses related to the lack of clear and decisive leadership in some of the Groups to progress design development. The evolution of the concept of 'Trinities' with explicit recognition of the importance of design/performance, delivery and commercial/cost aspects was an important innovation and helped maintain focus on key issues as well as contributing to Opportunities and Risks discussions. While the open and collaborative approach required from the different contributors in the Trinity structure took some time to become established in some cases, these groups were seen to work well into Phase 2 of the project and through detailed design, construction and fitting-out. The strong team ethic engendered is discussed in detail under *Collaboration and teamwork* above and was a critical element for the Alliance in striving to meet all of the performance criteria and targets on Advance II.

New Working Practices

One of the most challenging aspects of Advance II was the requirement for Alliance personnel to adapt to new working practices. This was difficult as not only were Alliance Members more familiar with working practices on what, compared to IPI, might be considered more conventional projects; but some of the personnel involved were also involved in these other projects in parallel with their work on Advance II. Each role felt the challenges of working under the IPI Model:

- for Alliance Board Members, the need to work collectively towards decisions and focus on strategic aspects of the project rather than on detailed operational and technical matters;
- for IPT members, the need also to work collectively and, in the absence of a more conventional project manager, to progress design and construction work towards target dates and costs;
- for those managing the Alliance and Coordinating the work of the IPT, the need to respect the different terms of reference of these entities, and to ensure clear communication between them so that the desired project outcomes remained in view and momentum was maintained;
- for cost managers, the need to consider cost management in very different terms to what they had been used to, frequently forecasting costs in the absence of supplier pricing and working through the Opportunities and Risks process to improve on investment and cost targets;
- for Working Group and Trinity personnel, to work collaboratively yet decisively to reconcile the sometimes competing demands of design, delivery and cost requirements.

Some personnel adapted to the new project environment more quickly than others, and this reflected the significance of the initial procurement and selection process in which the Client Advisory team attempted to identify organisations/individuals best able to work in an IPI context. More generally, the collaborative ethos engendered on the project through the early programme of workshops (see Part 5) and consistently through the IF's role in reminding participants of their collaborative obligations under IPI had a very significant impact in the achievement of project outcomes. That many of these were met and, in some cases, exceeded though design and construction innovation is a reflection of how well, overall, collaboration worked on Advance II. Design and construction innovations will now be discussed.

Design and building performance innovations

Overview

There are several design and building performance innovations to report from Advance II. The original Dudley College success criteria contained a number of requirements relating to building

performance (see points 3, 4, 7, 10-12 on Table 2, Part 4), and these aspects of the success criteria became a focus of Alliance attention in the early design phase (Phase 1). Building performance work also benefitted generally from the collaborative working ethos of Advance II; the improved communication and cooperation amongst partners working on different work packages (detailed below) contributing to innovative solutions.

The role of the Technical Independent Risk Assurer (TIRA)

Building performance was also a focus of the work of the TIRA (Technical Independent Risk Assurer), which is a key role under the IPI Model, providing independent evaluation and advice to the client and insurers on the technical risks associated with the project (see Parts 2 and 6). On Advance II, the TIRA (SECO, in association with their UK partners BLP Insurance) was appointed in September 2015. From November 2015 the TIRA regularly attended Alliance Board meetings and provided written reports to the client and, following Policy Inception, to the insurers also. In total, 17 reports were produced on the project, on average monthly between October 2015 and July 2017. As in the case of the FIRA (see Part 5: *Working to achieve the Target Outturn Cost – Phase 2*) these reports provide a substantive, independent and consistent account of the technical aspects of the project, including the design and performance innovations proposed and how the IPT was addressing them. This section of the report draws on these TIRA reports to support the account of design/performance innovation developed, and (where appropriate) to highlight the relevant technical risks. A table in Appendix 9 summarises the key issues arising in selected TIRA reports over the reporting period.

The TIRA reports always addressed Advance II technical issues in turn (i.e. Structural Issues; Architectural Issues; HVAC issues and Technical Installations) and highlighted issues of concern (from a TIRA perspective) that needed to be resolved by the IPT/Alliance. An intended benefit of the TIRA (and FIRA) role is that the organisation involved should be able to contribute their expertise to design development and innovation undertaken by the Alliance. However, while the TIRA was able to comment beneficially on specific innovation proposals on Advance II (see, for example, under *Thermal Mass, TABS and Ventilation Strategy* below), the TIRA had limited involvement in design development and there is no strong evidence that the contribution led to any significant changes on the project (see further in Part 8 below).

The more significant design and performance innovations will now be discussed.

Thermal Mass, TABS and Ventilation Strategy

In response to the strategic brief objectives of a low-carbon, low energy solution for Advance II, the IPT adopted several innovative systems and techniques which worked together to achieve brief requirements as well as providing acceptable comfort conditions for users. Innovative

collaborative working supported the integration of a high performance envelope, thermal mass using TABS (Thermally Adaptive Building System) heating, and an engineered natural ventilation strategy as detailed below.

In terms of **thermal mass and TABS**, the thermal modelling expertise from within the Alliance was mainly compliance-based (ie focused on the use of standardised modelling for ensuring design compliance with the thermal and energy performance requirements of the Building Regulations) and not advanced enough to advise on the design strategy contemplated by the Alliance early in Phase 1. A specialist consultant was therefore appointed by the Alliance to advise on this issue. The choice of a TABS solution was negotiated with the only supplier with significant portfolio of TABS projects (for all mainland Europe) and specific technical advice pre-contract was secured from the TABS supplier. The collaboration between Alliance partners (working through the IPT) enabled each aspect of the thermal mass solution to be carefully considered in turn (e.g. successive iterations of simulated thermal performance could be interrogated, challenged and changed by the Alliance team working together).

The development of a **natural ventilation solution** for the facility was innovative in that mechanical ventilation was the usual solution chosen for a facility of this type and was the solution adopted on the precursor project, Advance I. The choice of a natural ventilated solution required a high degree of collaboration between multiple designers, a key supplier and the Alliance team. The project TIRA also commented on the natural ventilation proposals via their reports; for example, SECO report no.5 (July 2016) provides specific advice to the Alliance concerning ventilation and adaptive thermal comfort issues for the facility. This independent scrutiny assisted the IPT to progress the design correctly. The collaborative work resulted in a ventilation strategy that included morning and night purge elements, as well as specific characteristics, as detailed below:

- Trickle Ventilation: close consultation between the Alliance architect, building services and supplier achieved a trickle ventilation solution for winter scenarios (Part F of the Building Regulations): target mm2 /linear m of trickle vents in the window casements. These were defined to produce sufficient overnight ventilation to achieve one air-change of fresh air (also allowed on the heating demand).
- User control: in addition to the trickle ventilation for winter operation, the system also provided for an element of user control via manual control of opening vents and windows for fresh air to suit occupancy and to help avoid overheating in summertime.

The solution (with three associated modes - shallow plan; cross-ventilation; deep plan atrium ventilation) fundamentally influenced the building form and layout by the Architect. The choice

of Top Hung Vent Panels (these being actuated but capable of manual operation) enabled direct user control that had a significant impact on perceived comfort and tolerance of overheating. Work on the natural ventilation solution was assisted by the key supplier for the work being both manufacturer and assembler; this facilitated better communication and sharing of knowledge/ideas amongst the IPT team.

Heating

Advance II utilized Uponor pipework on the project; a pre-insulated plastic piping system being combined with a secondary heating distribution pipe work system for the floor plates. A '3 in 1' construction process reduced installation time to a minimum and also reduced the need for a separate thermal insulation contractor. From a BMS perspective, the system is to be integrated into one central head and licence, reducing the client's capital spend with licence reduction (whilst also facilitating simpler BMS control/operation in future).

Façade

Concerns expressed by the IPT over the process of the initial design and choice of façade solution prior to the formal start of Phase 1 and without full involvement of the Alliance have been noted (see Parts 4 and 5 above). While the solution adopted in some respects facilitated the natural ventilation system proposed, it required a high degree of collaboration between architectural and engineering services disciplines in particular. This focused on a number of important issues. A key aim was to ensure that the design of the rainscreen panel system worked effectively with the naturally ventilated solution. In addition, extensive modelling and testing was required to achieve a working geometry of opening (ventilation) elements to demonstrate compliance with Building Regulations thermal, ventilation and daylighting requirements. Meeting daylighting performance requirements, and the client's preferences for visual/aesthetic treatment were also an essential part of this collaborative work.

Project Delivery Innovations

In addition to a range of new arrangements for establishing the Alliance as a functioning, collaborative team (see Part 5: *Developing the team – the facilitation process*) and allowing it to govern and manage the project (*Management and governance arrangements*), further innovations were directed towards project delivery. These focused on design and construction, and supplier procurement processes in Phase 2, and also contributed to developing a collaborative working environment on Advance II.

Collaborative Design & Delivery

Part 5 discussed the work of the IF to help Alliance Members become familiar with the IPI Model and to progress early project activities through a series of workshops in Phase 1. From the end of Phase 1 and through Phase 2 a further series of workshops (called 'Build in a Day' Workshops) enabled the IPT and Alliance Members to plan ahead collaboratively and to firm-up design management and information exchange issues necessary for construction and installation. The 'Build in a Day' workshops used 3D and 4D technologies (see under *The adoption of BIM* below) to bring Alliance Members and suppliers together to establish effective installation sequences whilst taking account of time/programme requirements, cost and the management of interfaces between trades/work packages. The Workshops also led to improvements in detailing and the early resolution of issues normally emerging during the installation process. A final 'Finish in a Day' Workshop focused on developing a shared understanding of completion works and sequencing required. A brief description of each workshop is provided below:

- **Build in a Day Workshop 1**: 9 February 2016. The first Build in a Day Workshop brought Alliance Members together to focus on an embryonic digital model of the Advance II facility and to agree actions going forward. The intense day of activities resulted in a listing of information requirements from participants to add to the emerging digital model. Further actions for the each of the IPT Working Groups were also identified, as were actions for individuals to follow up. Supplier attendance at this Workshop was low (many had yet to be procured to join the project). The Workshop energised the Alliance around the digital model but also brought about useful exchanges of opinion regarding the overall targets to be met.
- **Build in a Day Workshop 2**: 20 June 2016. Between the first and second Workshops (a period of some 4 months), the IPT had progressed the design significantly. Various suppliers had been engaged and the detail on the digital model had evolved. At this workshop, new suppliers to the project were in attendance. The workshop provided an overview of IPI (for the new suppliers joining the project) and a presentation from the project Information Manager about the information flows needed to make the BIM system operational. The Trinity arrangements for the IPT Working Groups were also presented at this workshop as well as the optimal information delivery cycles that Alliance personnel needed to follow in order to make the BIM system effective. The 4D model was presented (i.e. a 3D geometric digital model with project programme information [4D] added) as participants were invited to interrogate the model in detail around practical buildability aspects of the Advance II building. Many issues were identified through this exercise that needed further resolution (e.g. interfaces between the 'hangar' – the main workshop area –

and the Advance II accommodation block; the sequencing of access staircase work; flat roofing detailing; plantroom crane and storage arrangements; and external works sequencing). It was noted at the workshop that further detail on the sequencing of structural works would come from supplier input into the model. Following these discussions, attendees were invited to continue their work by collectively focusing on three key aspects: structural frame, thermal performance and M&E servicing practicalities. At this Workshop, the digital model was used collaboratively by all attendees and this was a very positive experience: the resulting discussions being very useful and informative for all parties. The workshop provided clear evidence of how collaboration could work when suppliers joined the Alliance team and all parties commented and discussed issues around the emerging digital model.

- **Build in a Day Workshop 3:** 13 December 2016 A 3rd Build in a Day Workshop, this time facilitated by the site manager from the Constructor, brought together key IPT personnel and suppliers on site to review construction issues together. The Workshop began with a restatement of important principles and project objectives: the FUSION ideals were reinforced to attendees as the IPI Facilitators felt that certain site operatives were not behaving as collaboratively as they could. Additionally, attendees were reminded of the important project completion dates: the aim of the workshop being to cut out waste from the programme and clarify the programme interfaces between parties. By this stage of the project, the intensity of work tasks meant careful management of different tasks was a priority, and the workshop aimed to make all attendees (and their site workers) aware of this reality This workshop was important for bring suppliers, Alliance personnel and site workers together. The collaboration engendered by the IPI model assisted resolution of tasks on site, but the overall need to meet project target completion dates provided a stronger impetus to get things done. The workings of the IPI gain/pain share mechanism obviously meant that financial consequences for Alliance partners were more real than for suppliers working on the project. However, the team ethos and collaboration amongst all parties (including suppliers) at this stage of the project continued to result in positive outcomes. The 3rd Build in a Day Workshop was an important event facilitating such a team approach.
- **Finish in a Day Workshop**: 13 June 2017 The Finish in a Day workshop brought together a large number of site workers to discuss overall project logistics, programme and finishing issues. A variety of issues were addressed, including electrical fittings work, arrival of College equipment; finishing of site entrance areas; labour resources on site; carpentry and ceiling trims. This focused and intense collaborative discussion was

important and useful for all attendees. It resulted in a clearer plan of action and boosted team morale at a critical juncture in the project.

Overall, these workshops had a very positive impact. The use of a 4D model was beneficial for both the IPT and specialist subcontractors by enabling participants to develop a good understanding of the project and, in a facilitated workshop environment, to discuss how they would work together to construct key elements of the Advance II facility. These Workshops also helped to engage new suppliers in the IPI Model and introduced them to the collaborative team environment that sought consensus and agreement on the best design and delivery/installation processes and timeframes.

However, it could be argued that the Workshops sought to resolve too much detail in advance of installation. The Constructors' Site Manager, for example, whilst recognising the value of the Build in a Day Workshops, also felt not all details needed to be resolved collaboratively:

> *"The Build in a day workshops focused too much on particular elements…we'd be stuck in late afternoon and still be talking about the steel frame and how to put all the bolts on, and then talking about fabricating a bracket... you don't need to be doing all that at that sort of meeting. I think maybe a couple of meetings upfront where you discuss roles and responsibilities, interface detailing, that would be good and the people are aware then, my single ply membrane is going to link up into the cladding and it's going to, you know, those are the areas that we're going to look at. Making people aware that they've got responsibility then to look at details that then we can have a further meeting down the line looking at closer detail at what they're doing in smaller meetings you know what I mean…"* (Site Manager: September 2017)

Supplier Procurement & Contracting

An important guiding principle regarding the procurement of suppliers under the IPI Model is that they are selected as early as possible so they can contribute to the emerging design and thinking about how it may be constructed effectively. The accompanying research report under this InnovateUK research project: *Work Package 20: Rationale of product selection: whether criteria of whole life costing, sustainability, etc. are being applied* (UoR, February 2016) provides a discussion of some of the innovative practices adopted for supplier procurement and contracting on Advance II. That report provides the basis for the following summary account:

- **The need to formalise supplier procurement**: this was identified as a matter of importance from the first Alliance Board meeting in March 2015. Early Board discussions noted the opportunities afforded by IPI to embrace product suppliers earlier than normal:

early engagement being noted as necessary and desirable if the potential benefits of working under IPI were to be realised. Particular concerns included:

  - The importance of potential suppliers in terms of project value and risk, and whether some should be invited to join the Alliance
  - How any new suppliers joining the project could embrace the IPI values, understand how the IPI Model works and how their costs would work on the project
  - The contractual terms on which they would be engaged (no standard form of Subcontract being available under the form of Alliance Contract adopted – see Part 6 above)

- **Developing a supplier procurement strategy**: An initial procurement matrix was proposed by the IF to categorise potential suppliers in terms of their value/risk to the project, and this was modified by an Alliance Member and developed into a simple procurement strategy (see Appendix 10) providing for tendered or negotiated appointments primarily on the basis of work package value (the threshold being £150k).
- **Using the supplier procurement strategy**: On Advance II, as on any comparable building project, there was a need to identify key suppliers (for major elements such as groundworks, structural frame, envelope and certain components of Mechanical and Electrical services) early in design development (Phase 1). The particular challenge on Advance II was that some Alliance Members believed that suppliers could not be formally engaged until after Policy Inception (Phase 2) – suppliers could, in fact, have been appointed with a 'drop out' provision should Policy Inception not be achieved. However, as Phase 1 progressed, work on procurement was felt by many Alliance Members to be lagging behind design development. By October 2015 the procurement strategy had been agreed and key suppliers identified during the latter stages of Phase 1 (autumn 2015). As part of this the Alliance wanted contracts with suppliers to be ready for placement following IPI Policy inception. To support this, dialogue was needed between key Alliance Members and potential subcontractors, and a series of 'Supplier Selection Days' were initiated.
- **Supplier Selection Days** were held during November 2015 to identify potential suppliers for key work packages (e.g. piling; groundworks; cladding) that needed to be placed early in Phase 2. These were similar to the 'Industry Days' used as part of the selection process for Alliance Members (see Part 5) and involved presentations about IPI and 'behavioural exercises' to assess the extent of firms' ability and willingness to work collaboratively on

Advance II. Suppliers were issued with the Advance II strategic brief and queried as follows:

  - What information would suppliers need to do their job?
  - How can BIM help in improving efficiencies with suppliers?
  - Is a performance specification enough as an information exchange document between designer & supplier?
  - What can we do to make your product cheaper to manufacture and install?

- **Early supplier selection – Phase 1**: Following the Supplier Days quotations were invited against defined scopes of work for each key work package and, by early 2016 the Alliance had identified preferred suppliers for key elements of Advance II , including piling, groundworks, cladding, frame, and celings and partitions.
- **Supplier engagement**: Following Policy Inception and the commencement of Phase 2, contracts were placed with preferred suppliers by the Constructor Member of the Alliance using a modified form of the NEC Short Form of Subcontract (see Part 6 above). Once engaged, suppliers were invited to attend the various Working Group/Trinity meetings, as well as the 'Build in a Day' workshops (see above)
- **Supplier selection: Phase 2**: The supplier selection process adopted in Phase 1 was used as the project moved into construction phase activity in Phase 2. Each IPT Work Group/Trinity was responsible for engaging and procuring appropriate suppliers for the project.

An issue of note regarding many of the suppliers on Advance II is that they often did not display the same commitment to collaborative working as the Alliance Members. This may partly be explained by the fact that suppliers were not part of the same commercial arrangements as Alliance Members and did not share in risk and reward in the same way through the Gain/Pain Share Mechanism. Alliance Members noted some general learning points:

- Some suppliers failed to take the initiative to complete work themselves, especially when project delay led to accelerated working in the later stages of the project preferring to wait for instructions from the Constructor.
- Suppliers often built risk into their price quotations for working on Advance II (ignoring Alliance instructions not to do so as working collaboratively would likely eliminate much of the risk involved)
- Some suppliers were unwilling to reduce their prices even following discussions with the IPT that identified ways they could complete their work faster and better.

- Initial IPT discussions with suppliers was felt to be hampered by some IPT personnel engaging with supplier sales staff instead of technical personnel.

Despite these challenges, suppliers on Advance II contributed to time and cost savings, for example, in the case of cladding in the rationalisation of panel sizing and areas of opening vents, window openings and positioning, together with interfaces with structural steelwork. Alliance Members believed that more traditional approaches to procuring suppliers would have postponed their involvement until well into Phase 2, delaying their contributions to design and buildability. While early supplier engagement is not particularly novel, the way it was implemented on Advance II – from the development of a supplier procurement strategy through to the selection process that mirrored the selection of Alliance Members – had some innovative elements and helped to encourage suppliers to feel part of the collaborative endeavour on Advance II.

The Advance II innovations, as noted, covered management, design and delivery aspects, and were made possible by – and supported – key elements of the IPI Model. Through interviews and a 'Lessons Learned' event held near project completion (see Part 3), key project participants reflected on the Advance II innovations that had been achieved. There was broad consensus amongst them that the IPI trial project had provided a great opportunity to innovate:

> *"Opportunity to think differently, that people were actually given the opportunity and actually encouraged to think differently about what they were doing and why they were doing it. That would result in a high quality, sustainable building, very much about innovation ...."* (Lessons Learned session 16 August 2017)

However, there was also a general perception that the project was somewhat too ambitious and suffered from trying to innovate in too many areas at the same time, whilst also pursuing challenging time and cost targets. As one interviewee reflected:

> *"I think that became a real burden for us actually in terms of our time and effort. The building was innovative in its approach, innovative in its design, innovative in the concept of the way the building would operate, the build, the types of materials used. We were in innovation overload really. And I think that again had real challenges for us. If you just built a project that you would normally build but do it in an innovative procurement way then that would be great, but the fact we actually innovated in all the other aspects as well, it became quite a burden I think for the team actually in some respects."* (Alliance Manager: 28 Sept 2017)

One important area for innovation (discussed in a separate section below) was in the adoption of BIM where, again, the aim of achieving 'BIM Level 2' (see below) was considered somewhat too ambitious for a project that was already innovating on so many different fronts:

> *"This goes back to probably too much innovation…it was potentially a step too far, the BIM aspiration of Level 2 plus no paper drawings on site was a little bit too far. In isolation, maybe one of them on each project would have been something to champion, but all together?"* (Lessons Learned 16 August 2017)

Also, on reflection, some Alliance Members felt that the approach may benefit from adopting elements of more 'traditional' design and construction:

> *"We stray too far from traditional, so when we spoke about innovation on the things that worked and haven't worked, yes we had innovation but did we have too much? So maybe we ought to move back somewhere towards a traditional approach. Because there's an argument on efficiency that actually traditional works really well, you get a full design, you go to the sub contractor, he prices it, he knows exactly what he's building."* (Lessons Learned session 16 August 2017)

While such comments reflect the multiple challenges on Advance II, there is also a recognition that much was achieved on the project, and that the outcome is considerably better than what might have been provided with a more conventional approach:

> *"There's no such thing as too much innovation! I cannot agree. What sort of building would we have given* [the client] *if we'd have done business as usual? We've built a building to give new construction skills to the economy in the West Midlands; it's an innovative building, it's looking forward."* (Project Coordinator)

Reflecting also on the role of Phase 3 (performance monitoring and ongoing improvement) under the IPI Model which, as the project has recently completed, does not form part of this report, one the InnovateUK Research Consortium noted:

> *"Having a Phase 3 – in which the members of the design team and site manager take part - is innovation in itself."* (Innovate UK Research Consortium Member)

The adoption of BIM

BIM on Advance II

Effective and comprehensive BIM use on Advance II was an important objective of the Advance II project. The aim derived from both the Dudley College client requirements and from the IPI

model of procurement and delivery that seeks to optimise project performance and value through the adoption of BIM. The Project Strategic Brief and Success Criteria, finally agreed at the conclusion of Phase 1 (December 2015; see Parts 4 and 5 above, and the accompanying report for InnovateUK under this research project: *Work Package 19: Reporting performance against success criteria*, University of Reading, November 2015) contained specific requirements regarding BIM use on the project. These were a mixture of how BIM would be used for project design and delivery, and the kind of BIM facilities to be provided for in the Advance II facility:

- Advance II is intended to develop and expand training opportunities in advanced building and construction skills with an emphasis on BIM technologies.
- The project is to unlock the productivity of the construction supply chain by closing the gap between design definition through BIM and the potential to de-risk projects, increasing delivery certainty and providing a basis for future asset management.
- Leading BIM methods and technologies to be adopted from commencement, including working towards the principles of 'Level 2'[17] BIM to help develop a model suitable for future facilities management and to provide the basis of a future teaching aid to be used on courses delivered in Advance II.
- A suite of IT areas/rooms (minimum three) to be provided in the completed Advance II facility, capable of delivering instruction and experience of advanced digital technologies and BIM.

These statements reflect the importance given to BIM on Advance II; the BIM Level 2 proficiency objective being a specific requirement of the project, even though Advance II is not a centrally procured UK government funded project. It was also the intention of the Alliance, encouraged by the IF to maximize opportunities afforded by the project to improve information management processes, both for the project and for the future operation and management of the completed facility. The work of the Alliance regarding BIM is described below; the overall achievement being commended by BSRIA as the closest they had seen to BIM Level 2 in the UK (in May 2017) (see *Work Package Report 35: Review of how BIM improves O&M access and performance data* – BSRIA, for more information).

Roles and Responsibilities

Initial BIM roles and responsibilities were defined in the Cultural and Commercial Alignment period up to the start of Phase 1 (February through to May 2015) as an initial BIM strategy for the project was agreed. The project IPT formed a BIM sub-group in April 2015 specifically to

address the adoption of BIM on Advance II and related design and coordination issues; this group initially being led by two members of the Project Coordinator organisation (a Project Coordinator and Project Information Manager). Each Alliance Member also nominated a BIM champion to sit on the BIM sub-group and coordinate BIM issues from that Member`s perspective. Prior to the first BIM subgroup meeting, the Project Coordinator contacted all Alliance Members with a standardised BIM Information Requirements document and blank model matrix in order to gauge BIM knowledge/capability from amongst the Alliance team. The information gathered from Alliance partners provided a clearer picture of BIM capabilities within the team; the Alliance partners with the greater BIM knowledge being the Architects and the Engineering Services and Project Coordinator organisation.

The Alliance team BIM capabilities were discussed further at the first BIM sub-group meeting, as the co-location of personnel leading BIM coordination was suggested as desirable (e.g. the Building Services Contractor would sit alongside the Engineering Services and Project Coordinator so the expertise of both could engage with BIM issues concurrently. It was agreed that NewForma Project Information Management software would be used as an initial project Common Data Environment (CDE) through which project information and digital drawings would be uploaded. It was envisaged that NewForma would be succeeded by 4Projects once the project had moved into Phase 2.

Through this alignment period, both the Alliance Board and IPT collectively agreed to make the best possible use of BIM on Advance II as the opportunity presented by the IPI model was unique and exciting. Precise BIM roles and responsibilities became more clearly defined as the project proceeded through Phase 1 and into Phase 2 (these are detailed in the project BIM Execution Plan [BEP] - which itself was continually revised through 2015 and 2016). For example, revision P02 of the BEP (July 2015) had 3 roles: Project Delivery Manager; Information Manager & Co-ordination. In revision P03 of the BEP (June 2016), these roles were combined into the Information Manager role. The final BIM roles became crystallized as Phase 2 started and were later confirmed in BEP P03 which was issued in June 2016 with the creation of a 'Trinity' for BIM management – see Part 2 on 'Trinities'. These roles are reviewed in detail in the accompanying report for Innovate UK on this research project: *Work Package 35: Review of how BIM improves O&M access and performance data*; BSRIA (May 2017).

Mobilizing a BIM-centric system

A further report on BIM for InnovateUK under this research project: *Work Package 25: Report on BIM implementation* (University of Reading, May 2016) provides a detailed review of Alliance work concerning BIM on the project from Phase 1 into Phase 2. Of particular note is the work

concerning project Work Package information requirements and the creation of a bi-weekly Information Delivery Cycle, as described below.

Devising project Work Package needs (and the associated information delivery) was a major piece of work for the Alliance. An Information Approval and Authorisation process had to be devised, with a Common Data Environment (CDE) established for information delivery and exchange between partners (the configuration of which took a considerable amount of work). The resulting Information Production Delivery Cycle (see Appendix 11) was formulated to ensure project partners submitted information promptly to the centralized CDE for an accurate, federated model of the Advance II building to be produced. An associated task was the creation of a new Plan of Work for the project (aligning information exchanges to the IPI work stages/phases) as the then available version of the RIBA Plan of Work (with BIM 'overlay') was considered to follow a largely sequential way of working and was inconsistent with more parallel working under the IPI Model on Advance II. A single BIM Execution Plan was also produced representing the whole of the supply chain process (normally projects would produce two BEPS: one pre-contract version and one post-contract version). As noted above, 4Projects duly succeeded NewForma as the project CDE in Phase 2.

The collective work of the Alliance regarding BIM adoption had many tangible benefits, as detailed below.

3D and 4D Modelling

Resulting from the Information Management work was the production of an evolving 4D model, formulated from data from Alliance Members and suppliers (the 4D model being the 3D model with the addition of time synchronised with the delivery programme). This innovation enabled project partners to view the emerging facility design and to identify specific aspects/issues of interest to them; the collaborative space also enabled them to speak with other professional colleagues about different aspects of building design, installation and fitting-out. Bi-weekly IPT model review discussions were key to this work, enabling all parties to review the digital Advance II building together. The Model enabled better ways of working to be identified by the Alliance partners and suppliers. For example, hangar work was left until later due to SIPS panel installation, with a better sequencing of work resulting.

Documentation

The collaborative approach to design using BIM reduced the amount of documentation that might otherwise by required to communicate and exchange information requirements between various parts of the design and delivery team. Consequently, the need for specifications to prescribe what

the constructors are required to deliver became largely redundant because they were directly involved in arriving at the design solution themselves.

The BIM model helped to ensure that continuity of information was preserved: the model generating both coordinated drawings and schedules and manufacturing data (in 2D); different subcontractors sharing CAD data to help detail interfaces (such information exchange is largely absent on more conventional projects due mainly to liability issues). Another distinct benefit of using BIM on Advance II is that, under IPI, there is no need for comprehensive documentation to record decisions taken as a safeguard against future liability. In these terms IPI facilitates the use of BIM without the potential liability constraints that may arise under more conventional contracts).

Facilitating Improvements

BIM also facilitated other innovative work on the project, including the following:

- The crane for installation in the hangar (workshop) area of Advance II was ordered using requirements data taken directly from the BIM model
- Point cloud scanning: The Advance II site was scanned before work began to create an accurate 3D survey of what existed. The point cloud data was also used in the production of location drawings for the site-based team workers, which is not normally done. A second scan was carried out when the steel structure was complete. This was then overlaid onto the 3D model to see if there were any discrepancies to measure the deviation, and enabled a verification of the as erected works against the design which allowed a degree of foresight in terms of how this would affect interfacing packages (e.g. SIPS and glazing).
- Laser setting out: using coordinates derived from the 3D models to set-out the internal partitions (in order that the task did not have to be done manually from 2D drawings). Sometimes the laser setting out worked well (with building services); sometimes it did not (with partition supplier).
- Health & Safety Cubes: using warning cubes in the model which have the designers risk assessment data embedded within them. This allows generation of the Designer Risk Assessment within the model authoring software. What was innovative was that the data was structured in line with risk properties as set in the Industry Foundation Class (IFC) standards, therefore being OpenBIM[18] compatible).
- The architectural model was built with OpenBIM (IFC) in mind. The BIM Information Manager confirmed that, as a result, this produced a good quality IFC export. This,

together with the workflow (which had been developed in Revit) could generate COBie[19] (Construction Operations Building Information Exchange) data directly from the IFC export.

Challenges

The work required to plan, set-up, communicate, manage and monitor a BIM-centric project was considerable. The Client was looking for guidance from the Alliance on an 'industry leading' arrangement. Conventional thinking is that a BIM Execution Plan (BEP) will help clarify arrangements for all project participants, and will draw on the Employer Information Requirement (EIR). In this case the client needed support with the development of the EIR, and the BIM Sub Group needed to meet with the client to clarify their information requirements in the early phases of the project. The definition of the IPI work stages was also important. It should be noted that the majority of this work has been conducted by personnel from the Architects and Engineering Services Project Coordinator. Without their dedicated input, the project would not have had a federated BIM model, together with important supporting mechanisms including the bi-weekly information management delivery cycle; a 4Projects User Guide; a BEP; and a clear forward plan.

A BIM-centric project challenged all Alliance Members and some other participants to review and revise their normal ways of working, adapt and make the changes necessary to make optimal use of the collaborative digital environment. There has been much learning regarding the establishment of a BIM-centric project. For example, the need to communicate to all parties (including those joining the project) the criticality of following the BEP; the need for parties to upload information in an appropriate format and the advantages of using Build in a Day workshops for facilitating collaboration and team-working.

A major challenge with mobilizing BIM on Advance II was the pressure placed on the Alliance partners with the necessary BIM knowledge to make the project a success (i.e. the Engineering Services Project Coordinator and the Architect). A lack of BIM capability and knowledge amongst some Alliance Members had significant impacts on these who had to brief and coach their colleagues, and ‘backfill’ when knowledge was lacking and guidance was needed, particularly by some suppliers and subcontractors also. This situation could perhaps have been avoided if the initial selection process had probed the BIM capabilities among the Alliance partners rather more. One impact on Advance II was that the time input for those Members with BIM capability was significant – the point is returned to under Part 8: *Conclusions* below.

A further challenge regarding BIM on Advance II was the use of drawings by site workers (instead of the BIM Level 2 objective of digital delivery – as originally envisaged by the project strategic brief). As the Site Manager commented in interview:

> *"A premise of the project was to actually build it off the model, the 3D model. But the level of information that was entered into it didn't really incorporate everything, all the information that we needed."* (Site Manager: September 2017)

The time and programme pressures of Advance II also contributed to site workers preferring to use their own familiar working methods rather than learning new methods: workers consequently requesting print outs from the digital model in order to execute their work. Of course, these rather minor issues should not detract from the significant BIM achievements on Advance II. The project not only recorded a strong degree of 'Level 2' implementation, but used 3D and 4D modelling to support effective collaborative working. More than that, it generated useful data for asset management (for more detail see the accompanying InnovateUK report on this research project: *Work Package 35: Review of how BIM improves O&M access and performance data*, BSRIA, May 2017) and provided usable BIM models and data as ongoing teaching aids for the College.

Site Processes

From the outset, the Advance II project aimed to achieve efficiencies in site processes. This intention stemmed from the collaborative nature of the IPI Model (i.e. that enhanced collaboration amongst Alliance Members should result in improved construction site communication, work practices and result in efficiencies and cost savings). There were many notable innovations relating to site processes; these reflecting the collective and focused effort of the Alliance (including the on-site team) to produce an excellent outcome for the Dudley College client. The achievement of the site efficiencies was only possible through the collaborative team approach of Advance II.

Innovations relating to site processes can be categorized under four distinct areas: prefabrication; off-site manufacturing; on site mechanisation and other innovations. They are discussed below in turn and are followed by an overall review of site process innovations with comments from the construction site manager for Advance II.

Prefabrication

Prefabrication was an important requirement identified by the client in the Project Success Criteria document (see Part 4, and Appendix 3). Like the adoption of BIM, this was meant to

form part of the teaching syllabus once the Advance II facility was in use. Some prefabrication techniques were investigated by the IPT in the early phase of the project, particularly in relation to the external services plantroom, located on the roof above the hangar/workshop. It was decided that the plantroom was to be fully prefabricated offsite and craned into position on the roof; the external cladding was then to be applied to match the adjacent facade. This was the approach finally employed for the project: a prefabricated plant room was completed 100% offsite (with all Building Management Systems, lighting and power wiring already completed and ready for on-site connection).

Off-site manufacturing

Off-site manufacture was identified as a key driver throughout the project and a way of meeting the stated Success Criteria, reducing the programme by increasing the speed of site installation. Within the Frame and Envelope Working Groups of the IPT, a number of early design meetings were held to discuss the overall envelope strategy, and the use of an off-site manufacture approach to volumetric spaces. However, due to the non-repetitive nature of the building, it was decided that such a strategy would not be suitable for Advance II. One area subsequently identified for the adoption of off-site manufacture was in the provision of the building envelope itself. A technique considered was cross laminated timber (CLT), where the envelope itself also forms the structural element – similar to structural insulated panels (SIPS). This would allow large sections of the external envelope to be manufactured off site and then craned into place. Discussions were held with a number of specialist sub-contractors but this option was also ultimately rejected. The proximity of the new construction to the existing building meant that extensive protection would have been necessary during construction, and other factors, such as cost and overall height of the building, made this option unsuitable.

The external envelope solution finally adopted was a SIPs (Structural Insulated Panels) approach, but consisting of discreet panels joined to the glazing elements so that the necessary requirements of the natural ventilation system could be accommodated. By combining the envelope panels and the glazing sections off site, the amount of work required on site was reduced, and hence the time required to install the external envelope was reduced. This approach also allowed for a more efficient use of cranage on site to install this package and the subsequent cladding. The early engagement of the various envelope and glazing sub-contractors and the building services designer/installer made this solution possible as effective ‘buildability’ options could be considered. Following further discussions it was decided to make adjustments to the steel frame to allow for possible ‘out of true’ alignment to avoid problems later with the installation of SIPs

panels and the cladding. This level of discussion was only possible due to the early involvement of the panel and cladding sub-contractors.

Other site innovations

A number of other site innovations on Advance II supported the new work practices and sought to make the project attractive and exciting for all those working on it. These changes were all aimed at maximising the potential benefits of working in an IPI way on the project with a particular focus on the speed and cost-effectiveness of site work.

Slab installation

An IPT-facilitated team event on site focused on slab installation and how a better and more efficient execution could be achieved by different team members working together. This was a very effective innovation on site and resulted in more rapid completion of this element of work.

Look Ahead meetings

Every 5 weeks, a site-based 'Look Ahead' review meeting between the IPT and Subcontractors on site for the different project work packages facilitated better group working and collaboration. The meetings used the 4D BIM model that had been developed and provided an open forum for all specialist input to be captured, and for opinions to be voiced about the most effective sequencing and installation practices.

Site-wide team meetings

The Look Ahead meetings were supplemented by more regular site-wide meetings for all professionals and specialists engaged on site. These meetings allowed progress to be reviewed regularly, with upcoming issues being identified for discussion and resolution.

Review of site innovations

The focus on site innovations and the range of measures adopted reflect how the IPT sought to implement the broad, collaborative operating principles of the IPI Model at site level, and particularly among specialist suppliers and subcontractors that had not been engaged in the project from the early stages. The Constructor's Site Manager was interviewed to obtain a view of how well these innovations worked, and how they may need to be adapted for use on future projects. He shared the initial optimism of the Alliance Board and IPT that the project would bring innovations and more efficient practices on site; this initial optimism resulting from the collaborative approach to be adopted. However, he also commented on what he perceived as a lack of clear decision-making on design early in the project, reflecting comments from others that the Alliance Board, IPT and, at times, Project Working Groups were not always as decisive as they could have been:

"Designs weren't decided upon early enough which prevented accurate programming. There was also a lack of completion dates to work from, a lack of information about when deliveries of machines and furniture for the workshops were arriving." (Site Manager)

Because the design was not detailed enough by the time construction work began, there were scheduling problems and issues with the final Advance II design detailing:

"There were items on the programme that weren't really nailed down that would enable us to move forward and bring some rigidity into the programme…we didn't really have a completion date to work to for most of the earlier stages of the project. So we didn't know what we needed to be doing in regards to FF&E mainly." (Site Manager)

Reflecting on the nature of introducing innovative practices on site, the Site Manager commented,

"There`s going to be the challenge with this collaborative working…it`s part of picking the right people and knowing that they needed to be guided one way or another, but asking people to do something they are not used to is challenging." (Site Manager)

Soft Landings

Introduction and key requirements

The Soft Landings concept originated over ten years ago, with an industry vision to develop an approach to project procurement and handover that would deliver better building outcomes. The accompanying InnovateUK research report *Work Package 30: Report on IPT priorities to meet the need to achieve Soft Landings***,** BSRIA, February 2017 provides an historic overview of the approach. In essence, the BSRIA Soft Landings Framework aims to encourage a cultural shift towards increased collaboration and awareness of project outcomes through the use of stakeholder workshops and design reviews. The key requirements for a Soft Landings approach (UBT and BSRIA, 2014) are as follows:

- set success criteria (in collaboration with the building users/operators) and appropriate acceptance criteria against which to test the success criteria
- continuously check that success criteria are being met through review of design and construction solutions amongst the project team
- familiarise all members of the project team with what Soft Landings is and to make clear what their part in achieving it is
- have a robust and realistic plan for handover, including commissioning, preparation of documentation, organising training of the appropriate nature for the right people and at the right time(s)

- have a meaningful programme of post occupancy evaluation activities to provide understanding on how the building is performing, and to inform any changes which may be necessary to deliver the client's original requirements.

Soft Landings on Advance II

Progress against key requirements

On Advance II, the intention was to carry out Soft Landings in accordance with the BSRIA Soft Landings Framework, but with the addition of setting metrics as prescribed in Government Soft Landings[20] (GSL).

Despite early efforts to mobilize Soft Landings (starting with a Soft Landings Awareness course held at the Constructor's offices in June 2015), there was little progress made on Soft Landings throughout 2015 and 2016 (see *Work Package Report 30*). Progress started to be made when the IF convened a fresh Alliance Board meeting to address Soft Landings issues in January 2017. This meeting addressed a number of topics, including the IF's understanding of Soft Landings and the use of a system operational interfaces (SOI) strategy to prepare for handover (see further below).

The BSRIA report on Soft Landings work (*Work Package 30*), recorded progress at February 2017 and noted how specific progress had been made against the key requirements for a Soft Landings approach, as follows:

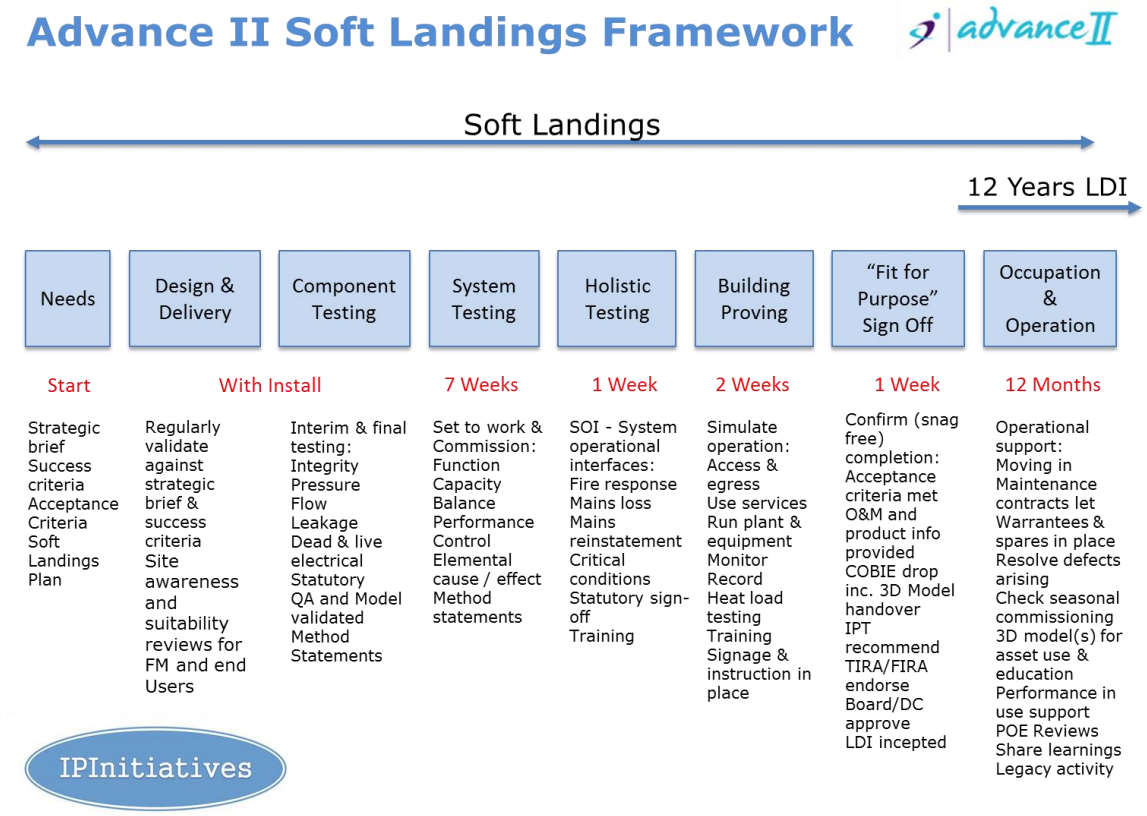
- The client had produced three documents (strategic brief, success criteria and acceptance criteria) at the outset of the project which set objectives and how they would be measured.
- Success criteria were presented at every design/construction review meeting (each solution being tested against the design criteria prior to acceptance). The strategic brief and risk register were also considered during these meetings.
- The introduction of an Advance II Soft Landings Framework and SOI (system operational interfaces) commissioning methodology prepared the project with a robust and realistic plan for handover, including commissioning, preparation of documentation and organisation of training.
- Development a post-occupancy assessment plan for the building in consultation with the client.

[20] Guidance on the Government Soft Landings policy and framework is provided at https://www.bsria.co.uk/services/design/soft-landings/free-guidance/

Advance II Soft Landings Framework

The Soft Landings framework developed early in 2017 by the IF for Advance II had seven specific stages, as illustrated in Figure 8 below. This framework clearly defined the general testing, commissioning and proving activities to be carried out in the period leading up to completion and handover of the building to the client. However, it was provided at a late stage in the project process and, as noted in the *Work Package 30* report, does not cover the design phase of the project. That said, as noted in WP30, continuous review of the project success criteria had been taking place on the project during Phases 1 and 2 and, indeed, the frequency of these reviews had been far in excess of that envisaged under the BSRIA Soft Landings Framework.

Figure 8: Advance II Soft Landings Framework



Summary of Soft Landings

The Work Package 30 report concluded that in terms of meeting Soft Landings requirements, although activity on Advance II did not always formally and explicitly comply with all aspects of the BSRIA Soft Landings Framework, it did follow many of its general principles. Additionally, in certain respects, work exceeded what would normally be expected, as noted above in terms of the regular reviews of design and project progress against success criteria. This was in spite of the fact that the Alliance as a whole perhaps did not fully embrace the Soft Landings concept. As the BSRIA InnovateUK research consortium member reflected,

> *"One of the key learnings from Dudley was people`s perception of what Soft Landings is and how little thought they gave to it."* (InnovateUK Research Consortium member)

It may be noted that, despite early attempts by both the Constructor and the Building Services Contractor to engage with the Soft Landings process, this was not always prioritised by the Alliance, some Members of which viewed the process as being required shortly before handover. Nevertheless, while what was adopted on Advance II was not, strictly speaking, a 'full' Soft Landings approach there was a very close alignment to many of the more significant requirements of the Soft Landings framework. For example, every week, the BIM Information Manager would closely scrutinize a new digital model of the building and check it against the project success criteria, risk register and client brief:

> *"What he used to do was he'd do it off the model but he would have the success criteria document and the risk register and the brief on the table at the same time. That is perfect Soft Landings procedure because any decision that's been made you're checking that it's meeting your success criteria. So that's a key strand."* (InnovateUK Research Consortium Member - BSRIA)

In this way, design development decisions were being carefully checked against key project criteria, though not, crucially, as part of an explicit Soft Landings process. The WP30 report concludes that, in terms of the key Soft Landings Requirements, Advance II met most, if not all of them, and suggested some important learning points:

- set success criteria…: This was done on Advance II, but needs to be incorporated into a project Soft Landings plan, explaining what needs to be done, by which party, and when.
- continuously check that success criteria are being met…: this was done on Advance II and needs to be replicated on further projects using the IPI Model
- familiarise all members of the project team with what Soft Landings is…: This was partly done on Advance II, but lacked a project-specific Soft Landings Plan (see above) to ensure it was fully implemented
- have a robust and realistic plan for handover, including commissioning.. This was done on Advance II, with the SOI (Systems Operational Interface) commissioning methodology providing a more comprehensive testing and proving process than might typically be provided on a project of this type
- have a meaningful programme of post occupancy evaluation activities…: This is planned for Advance II via Phase 3 work (see Part 2 above) and will require a number of post-occupancy studies aimed specifically at the needs of the client/users.

Further completion and post-occupancy activities on Advance II

A notable feature of the Soft Landings Framework for Advance II is the SOI (Systems Operational Interface) methodology to ensure that all building systems work together (as well as each being tested in isolation).

The testing and proving of building systems undertaken as part of this approach – involving IPT Members and College facilities management personnel working together in the closing weeks of the project – was extensive, including for example, physical operation of the building ventilation and heating system under a variety of likely use scenarios. An Alliance Board member commented in interview that the result of the Soft Landings work was a quality building that met and exceeded many of the original client success criteria elements,

> *"You can`t knock the quality…In spite of the fact that everything is late, the usual teething problems haven`t been there."* (Alliance Member: 17 Sept. 2017)

The project has (at the time of writing) recently been completed and is now in Phase 3 under the IPI Model. While Phase 3 is not covered in this report, ongoing analysis of project performance and improvement opportunities by the Alliance will provide further scope for a broader consideration of the effectiveness of the IPI Model on Advance II.

PART 8: CONCLUSIONS

As the first project to be completed under the IPI Model, Advance II for Dudley College has broken new ground in the application of insurance-backed alliancing in UK construction. The project has achieved many notable successes, and has generated valuable learning for future applications of the IPI Model, as well as for collaborative project working more generally. This part of the report reviews the achievements and lessons learned from Advance II as well as reflecting on the likely legacies of the project for improved collaborative working in UK construction.

Achievements on completion

Overall achievements: Project outcomes and the IPI Model

The Advance II project has provided a robust trial of the workability and value of the IPI Model for the procurement, organisation, design, construction and completion of a construction project. Achievements and challenges need to be viewed in the context of a project that was aiming to meet a challenging set of quality, cost and programme targets while at the same time pioneering completely new governance methods, organisational structures and operational processes.

Under the IPI Model, Dudley College has obtained a completed facility that, at the time of finalising this report (January to February 2018) it considers to be of high quality and meeting most of its key success criteria – and, by exploiting a range of technical and process innovations, exceeding many of them. Further, the project was delivered within the client's overall Investment Target and in time for the start of the 2017/18 academic year. While the Target Outturn Cost was exceeded by a small margin (c.1.8%), the client's share of the excess was some 0.34% of the Target Cost. Similarly, while the project was delivered four weeks after the revised completion date (on an overall construction programme of some 66 weeks), extensive testing and system 'proving' prior to handover – with client fit-out being incorporated during testing/commissioning – meant that the facility was ready for use on occupation.

A notable feature of the project has been the highly effective collaboration between designers and constructors, working in an Alliance with the client, and focused on achieving clearly stated strategic goals and success criteria. The IPI Model, with its comprehensive arrangements for procurement and governance throughout the project – ranging from formal procurement, contract and insurance provisions, through less formal (though very active) facilitation – has been instrumental in establishing and enabling a working environment in which this effective collaboration has flourished. Central to the IPI Model has been the sharing of risk and reward by

Alliance Members, engendering a sense of ownership of project outcomes and a sharing of responsibility for achieving them. Additionally, the IPI Policy with its unique insurance for cost overrun above an agreed 'excess' helped ensure that risks borne by the Alliance were manageable and shared, and provided a strong measure of cost certainty that supported the collaborative search for innovation.

Of course, the collaborative strength of the Alliance has been tested by important developments on Advance II, notably during detailed design and construction (Phase 2 of the IPI Model) when it emerged that the Target Outturn Cost might be exceeded and, later, when the agreed completion date came under threat. It is a testament to the robustness of the IPI Model that both the Alliance Contract and IPI Policy remained unchallenged through this process; and also that the collaborative commitment among the Alliance – supported throughout by Independent Facilitation – prevailed and helped to identify solutions founded on the collective approach to risk and reward sharing.

This testing environment for IPI – and the continuous search for improvement and learning that was central to the Action Research approach adopted on the InnovateUK research project examining the trial of IPI on Advance II – has helped identify many improvements for the IPI Model. These mainly affect the governance and management arrangements concerned with the detailed operation of IPI. And while there are suggested improvements also for the more formal mechanisms of IPI, the relevant changes required to the public procurement arrangements, the Alliance Contract and the IPI Policy are all relatively minor and do not alter their substantive content. In so far as this (albeit limited) trial of IPI on Advance II is concerned, the fundamental aspects of the IPI Model have been shown to be robust, workable and effective.

Perhaps the most significant measure of the success of the trial on IPI on Advance II is that, despite the challenges encountered – and the fact that Alliance Members have borne a share of the relatively small cost overrun – all the participants recorded the project as a very positive experience in collaborative working and one they would be keen to undertake again. The sharing of risk and reward by the Alliance, and the provision of opportunity for Members to work collaboratively towards project goals, while a significant departure from arrangements typically encountered in UK construction, are what participants found most valuable in the IPI Model. The more detailed project achievements arising from this collaboration, together with the lessons learned for how IP I arrangements may be improved will now be considered.

Key achievements and challenges: the IPI Model and its key mechanisms

The IPI Model overall (see Parts 5 to 7)

The Advance II project demonstrated that the complete cycle of a construction project (i.e. procurement; selection; team-building; design; construction; completion) can be completed using the IPI methodology and philosophy. Overall, the process has been workable and effective. However, participants' unfamiliarity with important elements of IPI, particularly through Commercial Alignment and into the early stages of Phase 1 (see Part 5) delayed the effective development of the design through to Policy Inception. Additionally, the requirements of early stage cost planning, in the absence of up-to-date market pricing data, posed particular challenges for the Alliance in understanding and agreeing the components of the Target Outturn Cost. Controlling project costs to achieve the Target Outturn Cost was also a challenge. While the façade costs in particular increased due to design changes made in the interim between Commercial Alignment and the start of Phase 1 (without complete Alliance involvement – see Parts 4 and 5), other costs proved difficult to forecast with certainty, with provisions for potential savings ('Opportunities') in particular becoming difficult to realise as the project progressed towards completion.

Procurement (see Part 5)

The successful completion of an OJEU-compliant IPI procurement, tendering and selection process in late 2014/early 2015 leading to the appointment of Alliance Partners was a notable achievement. Work here was focused on selecting appropriate Alliance Partners with the capability and aptitude for working collaboratively within a Most Economically Advantageous Tender (MEAT) approach. This 'people-focused' approach included

- pre-selection briefings of all tenderers on the essential requirements of the IPI Model;
- unique procurement documentation including the same IPI-specific PQQ and ITT documents (also in line with PAS 91:2010) for all tenderers, regardless of Lots;
- post tender interviews and 'behavioural workshops' designed to support the qualitative assessment of tenderers' submissions and help ensure that appropriate partners were selected to form an Alliance with essential collaborative values and partnering attitudes (later to be enshrined in FUSION principles) that could translate into positive work outcomes for the project.

While the procurement approach ran smoothly and was not subject to any challenge under the Public Contracts Regulations, further work under the InnovateUK research project examined the robustness of key provisions, including the requirements for demonstrating cost-effectiveness. A particular concern here was whether the mainly qualitative assessment of cost effectiveness under

the approach – involving the evaluation of bidders' responses to key questions on how cost would be managed – could be strengthened (see Part 5). One key outcome of this review was a stronger requirement for bidders to commit to a 'not to exceed' value for their respective Lots (a value which may be expressed as a percentage of the Investment Target) as well as the requirement to commit, as part of the Alliance, to the Target Outturn Cost. This review provided strong support for the use of IPI on future public projects in compliance with the UK Public Contracts Regulations.

The IPI Policy (see Part 6)

The development, inception and use of the IPI Policy on Advance II (insuring Alliance members against all usual construction risks and third party liabilities, including latent defects and financial loss cover) was one of the project's most notable achievements. Advance II is the first insurance-backed alliancing project of its kind in the UK, and development work on the policy wording and provisions undertaken by IPInitiatives and insurance brokers Griffiths & Armour (G&A) prior to the project was instrumental in ensuring its acceptance in the insurance market. While IPInitiatives and G&A, together with Rider Levett Bucknall as FIRA, did not charge development costs to the project – and indeed, waived an element of their fees associated with their more project-specific policy development costs – the insurers and underwriters sought to recover an element of the additional costs to them of reviewing and researching the particular risks involved with cost overrun cover in particular. Insurance costs on Advance II amounted to some 2.5% of the Target Outturn Cost (though excluding FIRA, TIRA and IF costs). While it is not possible to use this as a guide to likely future costs – each new project being assessed on its specific risks and merits – the was agreement among the participants involved that future costs should be less as the extraordinary costs associated with the first such policy become unnecessary.

The IPI Policy was not invoked on Advance II, the cost overrun falling within the policy excess (Pain Share). Once incepted, the Policy was not consulted regularly or extensively by the Alliance, though its 'no-fault' provisions were referred to from time to time by the IF to help remind Alliance Members of their commitment to each other to collaborate in a 'no-blame' environment. In this way, the Policy – as a critical element of the IPI Model, alongside the Alliance Contract and the Gain/Pain Share Mechanism – was seen by participants as performing its intended dual function of:

- Providing clear and enforceable insurance arrangements, covering the IPT in an Alliance with the client as a virtual organisation for a range of risks and liabilities, including cost overrun, and

- Supporting collaborative working between project participants, helping them to work together to develop shared solutions on a 'best for project' basis

By tying together the risks and liabilities of the Alliance as a single entity and at the same time limiting exposure to the risk of cost overrun, the Policy provided crucial support to collaborative working on the project. It may also be noted that the financial loss cover provided by the Policy (essentially providing a high degree of cost certainty up to the Gain/Pain Share limit/policy excess) was a key factor in the client's decision to adopt the IPI Model.

The Alliance Contract (see Part 6)

As with the development of the IPI Policy, the form of Alliance Contract used on Advance II had been the subject of much development prior to its use on the project. This was undertaken by IPInitiatives with support from lawyers K&L Gates and Nabarro. The multi-party contract was designed specifically to support the IPI Model, requiring Alliance Members to work collaboratively, sharing risk and reward in accordance with a Commercial Model agreed between them. The Contract was accepted quickly at the start of the project by all Alliance Members, without significant amendment. While clarification of specific contract requirements was provided from time to time by the IF in the early stages of Phase 1 in particular, mainly to remind Alliance Members about the workings of IPI and their obligations to each other, the Contract was not subject to significant differences of interpretation or any specific challenge throughout the project. Indeed, Alliance Members, keen to develop strong collaborative relationships with each other, perhaps focused more on their inter-personal nature rather than on what the contract had to say about them. The 'Review Event' provision, invoked in relation to the forecast cost overrun in July 2017 should, of course, have been used earlier when the circumstances giving rise to the Event initially arose. But this is an issue of contract management rather than about specific contract provisions *per se*, and generally the Alliance Contract performed its role of binding Members together in a functionally co-operative alliance focused on meeting and surpassing the client`s strategic brief and success criteria. And while it is ultimately difficult to disentangle the potential impact of the formal Alliance Contract provisions from other elements of the IPI Model – and particularly from the IF's role in 'interpreting' these provisions – the Contract may also be seen as reinforcing the less formal collaborative behaviours necessary to make the Advance II project a success.

Some generally minor improvements were made to the standard form of Alliance Contract used on Advance II as part of the ongoing review by IPInitiatives under the InnovateUK research project. As part of this work also a new matching subcontract (the Supplier Alliance Subcontract – see Part 6 above) was developed and is ready for use on future IPI projects.

The Commercial Model and the Gain/Pain Share Mechanism (see Parts 4 and 6)

The Commercial Model, including the Gain/Pain Share mechanism were integral components of the IPI apparatus for Advance II. The Commercial Model, with its subdivision of project and non-project costs presented Alliance Members with unfamiliar conventions for the treatment of cost. Despite this, the process of Commercial Alignment (during which Alliance Members of the IPT agree on *inter alia* the components making up the Defined Cost; their overhead and profit [OH&P] percentages, and the people who will work on the project) was concluded in a month following the first Alliance meeting. In retrospect, most participants agreed that Commercial Alignment was reached too quickly on Advance II. Further, while broad agreement on the rationale for Alliance Members' OH&P allocation had been achieved, there was insufficient clarity on the budget for Phase 1 work and, in particular, on what activities would be undertaken for the resources available nor how these would be tracked. Some participants felt that the pressure to conclude Commercial Alignment also led Members to agree on the allocation of roles and key appointments – including that of the Alliance Manager (see further below) – too quickly. IPI Guidance has subsequently been revised to require a 60 day Commercial Alignment process rather than the 30 day period initially envisaged (and included in the Alliance Contract).

Agreement on the Gain/Pain Share Mechanism, while not concluded until the later stages of Phase 1, nonetheless followed (to a large degree) the principle of equal shares first proposed in the very early stages of Commercial Alignment. In retrospect some participants – including the client – felt this was a commercial error, arguing that shares in Gain/Pain should reflect more the respective contributions to, and share in profit from the project by the different Alliance Members. Further, despite the allocation of a relatively low priority to time compared to cost (25:75) in the Gain/Pain Share Mechanism, the Alliance realised late in the project that the impact of some 8 weeks delay that was then forecast would have exhausted the maximum Pain Share amount. All participants, including the client and IPInitiatives agreed that time-related Pain Share was not intended to be punitive in this way and, in any event, the Alliance agreed an extension of time of some 10 weeks. The Interactive Incentive Calculation Tool that supports the Gain/Pain Share Mechanisms has since been adjusted to cap time-related Pain Share at an agreed proportion of the overall Pain Share amount.

In the event, the Alliance agreed to incur Pain Share only on cost overrun, with all but one of the Alliance Members bearing some 18.6% of the projected overrun of £0.180m. While the Mechanism, at least in terms of the its operation in the event of cost overrun, worked as planned, it could be queried whether it provided a sufficient incentive to achieve reductions in the Target Outturn Cost (or disincentive to avoid cost overrun). That may well be because the Target

Outturn Cost was too challenging, although the FIRA's benchmarking exercise immediately prior to Policy inception suggested that it was not. It may be because the maximum level of Pain Share in the Contract (some 5% of the Target Outturn Cost) was insufficient to provide a powerful enough disincentive for cost overrun. However, both Alliance Members *and* insurers were content with the Pain Share amount and it is difficult to estimate the point at which any increase in levels on future projects might provide a more powerful disincentive or indeed, discourage Alliance Members from participating at all.

TIRA and FIRA roles (see Parts 5 and 7)

Technical Independent Risk Assurer (TIRA) and Financial Independent Risk Assurer (FIRA) roles are an integral part of the IPI Model. While similar roles are sometimes used on projects to help safeguard third party interests (those of funders, for example), they are somewhat unusual in more general construction. Under the IPI Model they have a dual remit. Firstly, in Phase 1 to provide independent advice to the client, Alliance Board and Insurers (particularly at the end of Phase 1) on the technical/performance and financial aspects of the developing design, as well as supporting the Alliance through the provision of comment and expert opinion. And secondly, in Phase 2 to provide more of a monitoring and assurance role for the insurers, providing a third-party expert view on the achievability of project outcomes for the agreed Target Outturn Cost. While their involvement in the project in Phase 1 was welcomed, the extent of their influence was generally limited (primarily due to the fee/time available to them), though there is some evidence that FIRA input in particular in the early stages of the project led to the adoption on an overall, 5-storey solution mainly on the grounds of affordability.

While insures relied on, and valued regular TIRA and FIRA reports immediately prior to Policy Inception and subsequently during Phase 2, it is noteworthy that they decided not to novate TIRA and FIRA appointments from the client at the end of Phase 1, despite the roles being oriented towards the provision of advice to them. That decision was justified by the insurers who believed that arrangements prior to Policy Inception appeared to be working well and saw no need to change them, though it potentially creates a conflict of interest (which did not arise on Advance II) as the client is, of course, an Alliance Member. IPI Guidance has now been revised to omit novation of TIRA and FIRA appointments, the preferred approach being to appoint the TIRA and FIRA as subconsultants to the IF under a Deed covering IF, TIRA and FIRA roles. The intention is to provide a measure of coordination of the work of these specialist whilst maintaining their independent expert status.

Generally, both TIRA and FIRA felt that their expertise and potential contribution to the project was underused by the Alliance, through this raises questions about the fundamental nature of their

roles (advising the Alliance or safeguarding insurers' interests) and the resources and fees available to them.

Further achievements and challenges: IPI and collaborative working

One of the major achievements on Advance II was the extent of collaborative working that was established and maintained among the project participants and, in particular, among Alliance Members. And such collaboration was considered by Members to have made significant contributions to the achievement of many key project success criteria – as well as the betterment of some – generally working on a 'best for project' basis and putting the interests of the client and the project before those of individual Members. It is difficult, of course, to assess the quality and impact of collaborative working with any degree of precision in the absence of a directly comparable project being undertaken at the same time but with a more conventional approach. This is the essential conundrum of a project-based 'trial' of a new process like IPI on Advance II – both the project and the process being trialled combine to create a unique environment that has no ready comparator. Nonetheless, when considered alongside a 'good practice' model of teamwork and collaboration promoted by Constructing Excellence (see Part 7), the arrangements on Advance II exhibit a high degree of alignment with the principles and key requirements. And while this is due to many of the 'formal' IPI mechanisms considered immediately above, it is important also to recognise the significant roles of Independent Facilitation and of the governance and management arrangements adopted for the IPI Model.

Independent Facilitation (see Part 5)

On Advance II the role of the IF was crucial in establishing a project environment in which participants could work effectively together, and in encouraging and supporting collaborative working right through the different Phases of the project to completion and handover. As the IF (IPInitiatives) was also the organisation advising the client in the early stages of project set up and procurement, there was a strong measure of continuity from the pre-project activities of bidder briefing through to the early stages of team formation, Cultural and Commercial Alignment. While such continuity was important to the development of a collaborative environment on Advance II and will be important on future applications of IPI, it should not always require that early project advice and the IF role be provided by the same organisation.

That said, on Advance II there can be little doubt that the project benefitted greatly from the fact that the IF role was undertaken by IPInitiatives, the primary initiators of the IPI Model. As such, a good deal of the IF role involved explaining to participants unfamiliar with the process how IPI was designed to operate. Further, in the absence of clear guidance on detailed operational matters (for example, on the Opportunities and Risk process – see Part 5) the role also involved leading

the development of new processes 'on the job'. It is also perhaps inevitable that, in this context, Alliance Members often looked to the IF for an element of leadership when new problems were encountered, or when decision making was slow to progress as excessive discussion was sometimes mistaken for effective collaboration. The question of project leadership under the IPI Model is an important one and is discussed under *Management Arrangements* below. For its part, the IF was observed throughout the process to be very keen to emphasise its role as facilitation and not leadership. In the main, participants felt that an appropriate balance was achieved between advising the Alliance and facilitating its decision processes, but allowing it to conduct its business independently.

Workshops were an important tool in the IF's approach on Advance II. They dealt with a wide range of matters and were generally focused on developing a shared ownership of key issues and problems, and collective decision-making for resolving them. While there is evidence of a degree of 'workshop fatigue' amongst some project participants, the underlying concern seems to be as much about the extent to which a desire for collaboration may have led to a lack of decisive leadership on key issues (see further below), rather than about the number and focus of project workshops.

The IF's role in liaising with insurers during Phase 1 in the run up to Policy Inception and, thereafter, reporting to them should also be acknowledged. Again, it is clear that insurers were encouraged by positive reports of how well Alliance Members were working together prior to Policy Inception, and this was a factor in placing the Policy on workable terms and for an acceptable premium. The extent to which such reporting may be required on future projects using IPI remains to be seen, but it is likely to be needed in the early stages as the UK insurance market develops an understanding of the benefits and risks of collaborative working under IPI. Further, regular IF reports to both the client and insurers throughout the project helped to keep them engaged in the project and to understand the evolving risks and how the IPT was working collaboratively to address them. Again, this would seem essential on future applications of IPI.

Management Arrangements (see Part 5)

A significant amount of time was taken in the early stages of the project (through Commercial Alignment and into Phase 1) to establish workable project governance and management arrangements, and for the participants to become familiar with them. These arrangements were, for the most part, novel and worked well once established. Four specific areas are worthy of mention:

- Leadership – while good collaborative working relationships were established and maintained on Advance II, most participants agreed that at times the project lacked clear leadership and direction. Leadership is part of the Alliance Board's role under IPI, but the

Board's at times operational focus and a lack of clarity about the role of the Alliance Manager in particular impaired its effectiveness. A means is required harness the leadership potential of the Alliance while maintaining clarity about the business management role of the Alliance Manager (see below).

- The role of the Alliance Board – a lack of clarity between Board and IPT roles and the tendency of Board Members to involve themselves in some of the day-to-day operational decision-making on the project also impaired the effectiveness of governance arrangements on Advance II. Again, appropriate leadership of the Alliance Board would help maintain a strategic focus on the overall business of achieving project success criteria, with only those matters either proving intractable at IPT level or requiring more senior approval from Alliance Members being brought to the Board for resolution.
- The Alliance Manager and Project Coordinator – the decision to appoint a non-Alliance Member as Alliance Manager, whilst having certain advantages on Advance II (including the individual's significant project and commercial experience), did not always provide the Board with the business management that, in retrospect, it could have benefitted from. Future applications of IPI should consider the appointment of an Alliance Member to this role with a clearer remit. The Project Coordinator role, focusing more on IPT coordination and management was tested on Advance II and worked well. But it also requires a clearer remit, particularly in terms of authority, liaison with the Alliance Manager and reporting to the Alliance Board.
- Working groups and 'Trinities' – the 'Trinity' concept which ensured that work package-focused groups were able to consider design, delivery and commercial issues was an important innovation on Advance II that worked well and could be retained on further applications of the IPI Model, and could be enhanced through clear life cycle/cost benefit analysis.

A particular challenge on Advance II was that the governance and management arrangements were being applied for the first time in something of a developmental mode and without any prior experience. It is perhaps inevitable that it took some time and resource for project participants to become familiar with them. A further challenge – and one likely to occur in future applications of the approach – was that many of the participants were also engaged simultaneously on other projects that were operating under different arrangements, and from time to time they admitted to having to 'remember' the particular circumstances and operating environment of IPI. In this context the role of the IF in regularly reminding participants of their obligations and responsibilities under IPI (see above) needs to be recognised. Overall, however, the governance and management arrangements

on Advance II provided strong support for collaborative working and for the sharing of responsibility for project outcomes that is essential to the IPI Model.

Outcomes of Collaborative Working (see Part 7)

All Advance II participants believed that the IPI Model was instrumental in achieving a high degree of collaboration among them, compared to what they experienced on other construction projects. They believed that this contributed significantly to project outcomes, and to the development of innovative solutions in particular. They also felt it was important for maintaining project momentum and progress, generally seeking to avoid delay rather than using any difficulties to argue for further time.

Notable areas where collaborative working made an impact on project outcomes included:

- In the range of technical/performance innovations adopted, including the development of a naturally ventilated solution in a thermally adaptive building structure (TABS); the use of off-site fabrication for the plant room; and the provision of a facility with built in flexibility for future changes.
- In the development of BIM capability on the project – not all Alliance partners had similar BIM capability, and the 'burden' of BIM adoption fell disproportionately on the Architects and the Engineering Services and Project Coordination organisation who instructed, trained, coached and monitored other Members to support their use of BIM. Additionally, the BIM team on Advance II also had to fundamentally re-think and re-design information management process for a collaborative team environment.
- In the use of BIM on the project:
    - An OpenBIM (IFC) Architectural Model, providing the basis for an evolving 4D model was used throughout to inform collective design and construction decision making, improve site logistics and onsite management;
    - A COBie export from the model upon completion, providing the client with a complete BIM model (via 4Projects and in the Cloud) together with QR codes for show and tell features for future educational use.
- In the adoption of the Soft Landings process and the commencement of Phase 3 (monitoring and improving performance post-completion) – while the development of an Advance II Soft Landings framework occurred later than intended, the IPI Model embraces the approach with design development and decision making informed by a clear view of project success criteria and intended outcomes from the earliest stages. This, together with the use of a Systems Operational Interface (SOI) methodology helped ensure that systems proving,

commissioning and completion were effective and allowed immediate occupation on handover.

- In a range of site-focused process improvements, designed to engage subcontractors and suppliers that were not formally part of the Alliance in the collaborative environment of problem solving and responsibility sharing.

It is also notable that, when design work on the façade was developed outside of the collaborative environment of the full Alliance (in the period of delay between the completion of Commercial Alignment and contract execution), problems subsequently arose in implementing that solution within the Target Outturn Cost.

Discussion of collaboration on Advance II raises the issue of the somewhat 'special' nature of the project, given its status as a Cabinet Office 'Trial Project' and the first construction project in the UK to adopt the IPI Model with its range of novel arrangements including the IPI Policy and its cost overrun insurance. Participants have commented extensively on the high degree of collaboration among them, and the extent to which they felt they are 'all in this together'. They were, of course, aware of this special status and, while it is difficult to assess the extent to which it may have influenced their behaviour generally and their commitment to the project, the potential affect should not be ignored. The challenge for future applications of IPI will be to replicate the high degree of collaboration and shared responsibility established on Advance II without having the potential support of that projects' pioneering status. This could be overcome if IPI is adopted more widely as part of 'framework' approaches; if projects are of a size to warrant the full-time involvement of the core team (Alliance); and/or if clients increasingly see knowledge and experience of IPI as advantageous in the selection and appointment of team members. It is hoped that the challenge can be addressed by drawing on many of the lessons learned on Advance II – lessons, it may be noted, that are derived from Action Research undertaken as the project was 'live' and based primarily on the participants' own accounts of their experiences. These lessons will now be summarised.

Lessons learned and recommendations for improvement

This section captures the key lessons learned on Advance II to identify areas for improvement in the further application and development of the IPI Model. These lessons arise from the analysis and conclusions presented thus far in this report, which is based on a close observation of key project events via an Action Research approach, supplemented by an examination of the documented project record. Lessons are also based on key participants' own accounts of their experiences on the project and their views on the effectiveness of the IPI Model, captured during

interviews (both in-project and post-project) and in a 'Lessons Learned' workshop held shortly before project completion. And they also draw on comments and insights from the InnovateUK Research Consortium monitoring the application of IPI on Advance II – Part 3 describes the research methodology in further detail.

While these lessons are based on the most comprehensive account of the project currently available, it must be remembered that Phase 3 (monitoring and improving performance post-completion) of the project is still underway and further learning may well emerge from that process, as well as from more mature reflection on project processes and outcomes by the project participants. Nonetheless, it is possible to summarise a number of important lessons learned from the project at this stage, and these are presented below in terms of key elements of the IPI Model. In some cases, as will be seen, lessons have already been implemented by the IPI originators in the form of revised Guidance, Procedures and Contract Forms.

The IPI Model and mechanisms

Procurement and early stages

The IPI procurement and selection process on Advance II resulted in a team of Alliance partners whose commitment to collaboration and working differently helped deliver a high quality facility for Dudley College. Key learning points include the need to:

- strengthen the cost-effectiveness requirements in the procurement of Alliance partners to ensure compliance with OJEU MEAT selection by requiring bidders to:
    - commit to 'not to exceed values' for their respective Lots and, as part of an Alliance, to
    - commit to achieving the Target Outturn Cost.
- ensure, as appropriate, adequate BIM capability of potential Alliance partners at selection stage (the use of BIM at Level 2 is an important enabler of collaboration among Alliance Members). It must be acknowledged, however, that for some organisations the opportunity to develop their BIM capability will arise mainly through project involvement and a lack of adequate capability at the outset need not always preclude their selection, provided of course they offer other potential benefits to the project.
- maintain a focus throughout the procurement process on informing potential Alliance partners of the requirements or working under IPI and what will be expected of them
- ensure adequate time is provided for Commercial Alignment (the IPI Guidance and Form of Alliance Contract has now been altered from 30 days to 60 days to allow for this); more specific issues to be concluded during Commercial Alignment include:

    - agreement on baseline data for the Target Outturn Cost on an elemental basis
    - agreement on a resource plan (i.e. people costs/resources costs) for Phase 1
    - an estimate of an initial Target Outturn Cost
    - agreement on the process for selecting the Alliance Manager
    - agreement on how to allocate Members' OH&P (Ring Fenced Sum)
    - payment of a proportion (to be agreed) of the Ring Fenced Sum during the Commercial Alignment period
- ensure that all Alliance Members are party to key decisions made in the early stages of design development, and subsequently (avoiding the disagreements arising on Advance II over responsibilities for the façade design that was developed outside of the full Allliance)
- recognise the challenges in adopting new (IPI) processes as well as setting and achieving challenging project performance targets; avoid over-ambition.

The IPI Policy

A small number of learning points arise for improving the IPI Policy, including the need to:

- engage with the project underwriters early in Phase 1 to help avoid delay between the submission of the project for cover and IPI Policy inception
- ensure that, in the development and agreement of appropriate IPI Policy terms and premium, brokers, insurers, underwriters, and Alliance Members all work closely together to develop a shared understanding of the project specific-risks
- clarify the treatment of multiple small claims in the 'all risks' section of the Policy and their impact on the policy excess and potential Pain Share
- consider arrangements for the loss-adjusting process in the event of a claim, including the (potential) role of the FIRA in the process.

The Alliance Contract and contract management

Few issues arose on Advance II to suggest significant improvements to the Alliance Contract. The need for a separate Supplier Alliance Subcontract agreement was addressed by IPInitiatives and this is now available as part of an evolving suite of IPI contract documentation. In terms of contract management, the key learning points include the need to:

- ensure that all Alliance Members are aware of their contractual roles and obligations, and those of others, including the significant IPI provisions
- ensure that, specifically in relation to potential 'Review Events', that any issues that potentially give rise to events that may alter the project scope, Target Outturn Cost and/or Completion Date are identified and dealt with in a timely manner in accordance with the contract terms.

The Commercial Model, Gain/Pain Share, and Cost Planning

Some important learning points for the treatment of components of the Commercial Model (including People/Resource costs and OH&P in Phase 1) are covered under Commercial Alignment in *Procurement and early stages* above. Other learning points, covering the operation of the Gain/Pain Share Mechanism and the Cost Planning process more generally include the need to:

- consider if more FIRA input could help during the Commercial Alignment period (for example, by assisting with cost benchmarking for similar projects)
- consider agreeing Gain/Pain Shares that reflect respective contributions to/and earnings from the project by different Alliance Members
- consider adjusting the proportion of time:cost in the Gain/Pain Share Mechanism to ensure that failure to achieve either requirement does not become disproportionately punitive. Modelling of possible outcomes using the Interactive Incentive Calculation Tool should help identify an appropriate balance. Note that IPInitiatives have already modified the Tool to cap time-related Pain Share at an agreed proportion of the overall Pain Share amount.
- consider, in terms of agreeing the Target Outturn Cost, whether:
    - the total is both genuinely challenging and achievable through innovation
    - adequate provision is included for ongoing team-building/coaching/mentoring throughout
    - a budget for Phase 3 should be included
- ensure that the Alliance has the requisite cost planning expertise and data, and can undertake acceptably accurate cost planning and forecasting both with and without detailed supplier/subcontractor cost input
- consider more targeted facilitation in relation to cost management, to assist understanding and good practice in collaborative, 'open book' accounting
- explore potential levels of Gain/Pain Share to examine how best to retain potential Alliance partners interest in IPI while at the same time providing a sufficient incentive for bettering the Target Cost and a disincentive for exceeding it. Test any new proposals in a revised Gain/Pain Share model.

TIRA and FIRA roles

While the TIRA and FIRA roles worked well on Advance II, the organisations involved both felt that more could have been made of their potential contribution to the project, particularly in the early stages. Learning points from the project include the need to:

- consider whether more TIRA input during Phase 1 could support the Alliance in design development and the identification and evaluation of appropriate technical/performance innovation opportunities
- consider whether more FIRA input in Phase 1 could support the Alliance in identifying and setting an achievable Target Cost (through, for example, the provision of additional benchmarking advice, support and data)
- consider, as under *The IPI Policy* above, whether the FIRA could have a loss-adjusting role in assessing claims under the IPI Policy, and the implications for all parties
- examine how TIRA and FIRA appointments as subconsultants to the IF might work under different scenarios, and whether their independence and key role in advising the insurer on key technical and cost risk issues can be effectively maintained. Confirm findings in new IPI Guidance.

IPI and collaborative working

Facilitation

The role of Independent Facilitation was crucial on Advance II in establishing and maintaining a collaborative working environment, guiding the Alliance through the IPI Model and in helping Members take ownership and responsibility for the project. The IF also has a role in reporting to the client and the insurers, and it is important that the IF avoids taking on a project leadership role. Key learning points for facilitation on the project include the need to:

- maintain a focus on collaborative working, assessing Alliance progress against an appropriate model (Advance II used the FUSION principles, but other models of collaborative working could be used, including that by Constructing Excellence discussed in Part 7 above)
- use the workshop tool effectively – the 'Plan in a Day' and 'Build in a Day' workshops (structured around the digital model) helped to ensure that key supplier input on the emerging design and site logistics was provided when required.
- ensure engagement with key suppliers that are not members of the Alliance. On Advance II this was very much left to the IPT Working Groups/Trinities, resulting in some inconsistencies in approach, with mixed messages being delivered to suppliers. The IF could have a role here also, helping to ensure that suppliers understand why IPI would potentially help them do their work better, and to provide support and coaching for them to work collaboratively under the IPI Model.

Management arrangements

As noted above, management arrangements on IPT were novel and generally worked well, but took some time to become established with project participants who were not familiar with them. Key areas concern overall project leadership and the roles of the different organisational entities under the IPI Model, and key learning points include the need to:

- establish a clear role for an Alliance Member to provide leadership and direction within the broadly collaborative environment of the Alliance. This could be provided by a reconstituted Alliance Manager role (see below)
- clarify the primarily strategic role of the Alliance as distinct from the IPT. In managing the Alliance Board, ensure the focus is maintained on strategic project matters
- review the role of the Alliance Manager, and consider whether it should be provided by an Alliance Member with a stake in the Gain/Pain Share Mechanism and with more leadership authority. Clearly distinguish the role from that of the Project Coordinator and, if the role of the Alliance Manager is to be provided independently of the Alliance, consider the need for additional Alliance leadership (see above).
- investigate the implications of the Alliance Board deciding to use majority voting for decisions, particularly in relation to design decisions that may have cost or Gain/Pain Share implications for all parties. Consider if revised arrangements are necessary as a result of this review.
- ensure that 'Trinity' arrangements are applied to all project Work Packages.
- investigate a range of financial organisations capable of hosting a Project Bank Account (PBA) and identify potential PBA providers for future projects to enable a PBA to be established relatively smoothly
- more generally, develop an IPI 'communication protocol' to help manage communications between the Alliance Board and IPT, and between the IPT and Working Groups/Trinities. In addition to providing procedures for communications management between the different organisational entities in IPI, this could also provide a range of standardised templates (standardised meeting agendas, reporting templates, etc) that would help future IPI projects.

Collaborative working, including roles and responsibilities

The establishment of a project 'environment' conducive to collaborative working – and the extent of collaboration observed among project participants – were notable achievements on Advance II. As noted, a key element in this was the IF's focus on encouraging and supporting collaborative

endeavour from the early stages of team selection through to completion. Key learning points include the need to:

- maintain an ongoing focus throughout the project on the need for Alliance Members to work closely together by reminding them of their shared objectives and commitment to collaborative principles (e.g. FUSION principles)
- maintain continuity of personnel throughout the project:
    - ensure, as far as possible, that personnel put forward for the project at tender stage remain involved once the project gets underway
    - avoid separate pre-construction and construction teams
    - be prepared, as Alliance Members, to replace personnel who do not embrace collaborative working
- identify opportunities to promote good collaborative practice and celebrate successes achieved
- recognise the challenges in working collaboratively on projects of a similar scale to Advance II where involvement of some suppliers will be occasional and not all can be Alliance Members; work to engage suppliers in the collaborative process (as under *Facilitation* above) and with the help of the Supplier Alliance Subcontract.
- avoid developing design solutions until the Alliance has agreed to work in a collaborative way (ideally, no design solutions should be developed until a Phase 1 Project Execution Plan [PEP] has been agreed).
- ensure that specific requirements (for example, for adopting the Soft Landings process) are introduced in a timely manner, possibly by stipulating these them in the Alliance Contract.

The next steps

The need for skills development

While it is hoped that, on the basis of lessons learned on Advance II, further projects will adopt and help improve the IPI Model, an important constraint will be in the skills available to apply the process effectively. Skills development is needed, not only among potential Alliance Members and their associated supply chains, but for clientship and for independent facilitation also. Key areas for development among suppliers interested in becoming part of an IPI project alliance include:

- Cost planning and cost management of design, particularly through the early design stages – experience through Phase 1 in particular identified difficulties in developing robust and cost forecasts that can be used to support design development when detailed market prices

and data are not available from suppliers. This is particularly important for identifying and testing possible innovative solutions early in the process;

- Opportunity and Risk management – related to the issue of cost planning and management through the early design stages is the identification, quantification and management of opportunities and risks. Team members need to be able to focus more on opportunity capture and exploitation; and on risk management and/or avoidance, not only in Phase 1 but through the Phase 2 Execution phase also.
- Leadership in a collaborative environment – this is a key theme to emerge from Advance II, and one of the more difficult to articulate. Alliance members will be needed who can combine diplomacy and drive; balancing the fairness and inclusivity necessary for effective collaboration, with a strong sense of purpose and momentum to drive projects towards a timely and effective conclusion.

Clients, particularly repeat clients who undertake repeat work will benefit from an understanding on what is involved in the IPI Model and, in particular, on their role and responsibilities as a member of a project alliance, sharing in risk and reward with other members. And of course, rolling-out the IPI Model across further projects will also require an expanded cohort of independent facilitators, beyond the initiators of the process who performed the role on Advance II. This is particularly important if the process is to have wider impact and achieve the potential demonstrated beyond the immediate participants in, and beneficiaries of this trial project.

Setting and managing expectations

An important recommendation under *The IPI Model and Mechanisms* above is to recognise the challenges in adopting new (IPI) processes as well as achieving stretching project targets. There is a sense from many of the Advance II participants that the ambitions of this first trial of the IPI Model were perhaps too high; that expecting exemplary performance in an untried project environment was too challenging. As the Project Coordinator noted:

> *With the benefit of hindsight, we tried to change the whole industry in one project. And we were too ambitious in that respect."* (Project Coordinator)

A legacy of Advance II is perhaps that future IPI projects would benefit from having a more balanced ambition, recognising that changes to project structures and more collaborative working practices are achievements in themselves. Further, realising the performance benefits will take some time, though the potential to change practice *and* develop high quality, innovative and cost-effective solutions is evident from Advance II. In the final section, the legacies of Advance II are considered briefly to conclude this account of first trial of the IPI Model.

Legacies of Advance II

As the first full trial of IPI in the UK, it is important to bear in mind that the Advance II project represents as much the start of a new approach to insurance-backed alliancing as it does the conclusion of the development of IPI that preceded it. As such, the achievements on one project – with its special 'trial' status and unique circumstances – should not be overstated. Similarly, the challenges encountered should not detract from the project successes and the learning gained from applying a new process in the real and often challenging environment of construction project development and delivery. Overall, the project has demonstrated the potential attractiveness of the IPI Model for all participants – client, suppliers and insurers – and the potential benefits possible when key participants work together in an Alliance supported by insurance, including the provision of cost overrun cover. Additionally, while Phase 3 of the IPI Model (monitor and improve performance) is not part of this research project, it may be expected that further benefits are likely to result from it for the longer term use of the completed Advance II facility. In all these terms the project can leave a lasting legacy for UK construction.

Throughout this report, the collaborative working environment created and fostered by the IPI Model has been noted, together with the extent to which project participants have embraced a sharing of responsibility for project outcomes as an essential pre-condition of effective collaboration. It must be remembered that this was enabled by the IPI Model overall – with its wide ranging provisions including procurement processes, contract and commercial arrangements and insurance, as well as its less formal governance, management and facilitation measures – and it does not seem helpful to try to isolate particular elements as being especially influential. Looking ahead to future applications of the IPI Model, it is important – albeit with some improvements that are documented in this report – to deploy as much of the apparatus as used on Advance II as possible if the potential benefits of collaborative working under IPI are to be realised.

Additionally, the IPI Policy used on Advance II, covering the Alliance as a 'virtual company' and providing insurance for project cost overrun is an important new product in the construction insurance market. More than that, it potentially represents something of a turning point in the management of risk and uncertainty on construction projects. Its attractiveness to insurers is essentially that, by exploiting the potential of collaborative working – and by incorporating other provisions including independent technical and financial review – the risk of poor project outcomes is significantly reduced.

> *"Do I think IPI is a workable proposition? Yes, I do. And I think it's going to be attractive to the private sector. It has certainly become a lot more viable because it is not*

just insurance. It's about culture, procurement, and linking all of that together…" (Insurance Broker)

Suppliers also limited their risk exposure in return for a share of potential Gain. And its attractiveness to the Advance II client – essentially by limiting cost risk to a proportion of the agreed Pain Share – was a key feature in the adoption of the approach. Such 'crystalisation' of risk is to be welcomed, providing clarity and transparency in the management of what is typically a hidden component of project pricing. These benefits should help ensure that this form of insurance becomes more widely used and applied on projects of a larger scale than Advance II.

Finally, for the individual organisations involved in Advance II, the legacies are more direct and real. Their experience has given them an appetite for working in this way[21], the client commenting (on whether he would do another IPI project):

> *"I think on reflection I would. Because I think the second time around some of the vagaries, uncertainties would already be in my mind, so we'd know what to sort out from the beginning."* (Client Representative)

For suppliers, it is the emphasis on collaborative working with an explicit focus on achieving quality project outcomes that perhaps holds most promise; the consequences for suppliers, their clients and insurers that embrace this approach are potentially very positive:

> *"If IPI develops as we hope, my view is it will be driven by quality: quality clients with quality teams. And if there's a consistent supply team that has done a lot of good work then in my view the cost of IPI for that type of client, with that type of supply chain, would come down. …*[and] *in those circumstances when a project has been through a quality IPI Model with an informed client, if I were the insurer I'd want to insure that project post completion." (Insurance Broker)*

The real legacy of the application of IPI on Advance II will only be evident in time. But the first successful trial of IPI on Advance II has already established a view of what is possible with insurance-backed alliancing, and provides valuable insights to how the significant benefits may be realised in future projects.

[21] At the time of finalising this report (January to February 2018), a new project adopting the IPI Model is getting underway to create a 'Museum of Making' at Derby Silk Mill, involving the constructor from Advance II. See http://www.constructionmanagermagazine.com/news/speller-metcalfe-use-ipi-derby-silk-mill-project/

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APPENDICES

Appendix 1: The IPI Model Map

Appendix 2: Research interviews and lessons learned workshop on Advance II

Appendix 3: Advance II at Dudley College – Project Details

Appendix 4: Advance II Cost Breakdown and Summary of FIRA reporting

Appendix 5: Alliance Contract – illustrative extracts

Appendix 6: The IPI Commercial Model (and Gain/Pain Share Mechanism)

Appendix 7: Collaborative working on Advance II – IF reporting

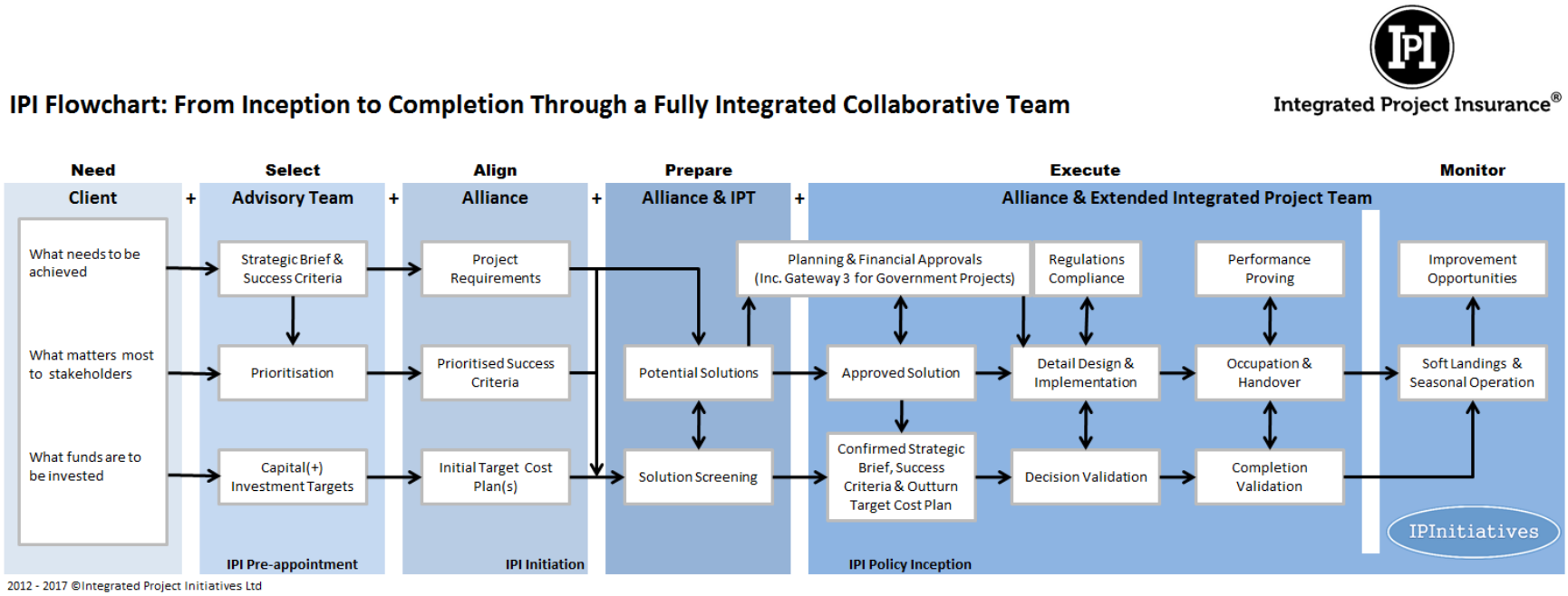
Appendix 8: Constructing Excellence Teamworking Matrix

Appendix 9: Summary of TIRA reporting

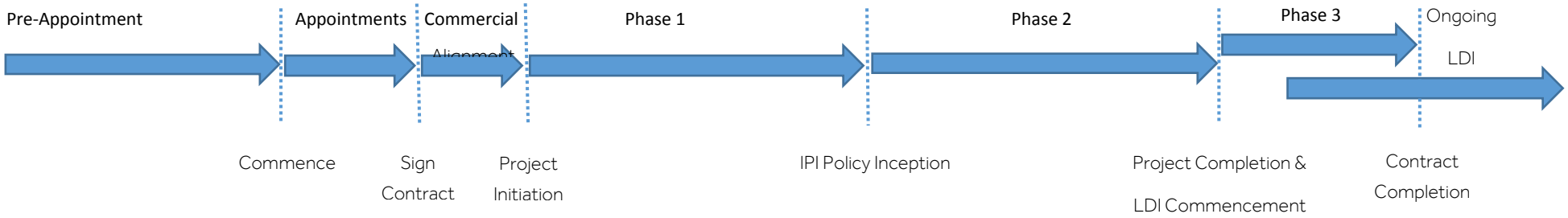
Appendix 10: Advance II supplier procurement strategy

Appendix 11: BIM on Advance II

APPENDIX 1: IPI Model Map



Alliance Contract Mapping



APPENDIX 2: Research interviews and lessons learned workshop on Advance II

A. Organisations participating in research interviews
B. In-project Interview Outline
C. Post-Project Interview Outline
D. Lessons Learned Workshop Agenda

2A: Organisations/individuals participating in research interviews

Dudley College (Client)	Principal/CEO
	Director of Estates
Metz Architects (Architect)	Director
	Technical Director
	Architect
Spellar Metcalfe (Constructor)	Director/Construction Manager
	Site Manager
	Quantity Surveyor
	Commercial Manager
Pick Everard (Structural Engineer)	Partner
Fulcro (Engineering Services and Project Coordinator)	Director
	Project co-ordinator
Derry Building Services (M&E Specialist)	Design Manager
	Commercial Manager
	Mechanical Engineer
	Contracts Manager
IPInitiatives (Independent Facilitator)	Principal
	Facilitator
	Facilitator
MDA (Client Advisor)	Alliance Manager
RLB Ltd (FIRA)	Partner
SECO (TIRA)	Director
Griffiths & Armour (Insurance Broker)	Partner
Royal and Sun Alliance (Insurer)	Insurer
BSRIA (InnovateUK Research Consortium Member)	Principal Consultant

2B: In-project Interview Outline

Delivering more for less under the IPI model

Advance II – in-project review of project progress and the use of the IPI Model

Interview outline

Interviews with the following Alliance Board members will be conducted every quarter for the duration of the project:

- Metz Architects
- Pick Everard
- Derry Building Services
- Fulcro
- Speller Metcalfe
- Dudley College
- MDA

Interviews of up to 1 hour in duration will be recorded and transcribed for analysis. Further interviews with the larger IPT (Integrated Project Team) will also be conducted at appropriate times of the project.

Questions

Interview questions will probe Alliance team member opinion and experiences of working under an IPI model of procurement and delivery. The semi-structured questions are divided into distinct areas and will facilitate an open discussion of how IPI works and the issues/concerns Alliance members have.

Procurement

1. What do you think of procurement under the IPI model (the bidding for Lots; the PQQ; the ITT; the interviews)? What forms of procurement do you generally work under? How does IPI compare to these other forms?

2. When your company was bidding, was there an assumption that an IPI project would require more work? Was IPI procurement more burdensome than you expected? Was IPI procurement more burdensome than you expected?

3. Do you have any thoughts on how IPI procurement may be improved in the future?

* give interviewee the PQQ/ITT questionnaire to complete and return*

Alliance Contract

1. A unique feature of IPI is the Alliance contract. What are your thoughts about the Alliance contract up to the present (Phase 1)?

Alliance Management & roles/responsibilities

1. IPI brings new managerial structures into play for a construction project (e.g. an Alliance Board; IPT – Integrated Project Team; Sub-Groups). What is your thoughts about the Alliance

structure and management so far? (i.e. *communication complexity*; *number of people involved; time/delays; co-ordination of activities)*

2. What are your thoughts about the IPI Facilitator roles so far? (e.g. educational role; assisting role) Do you have any issues/concerns about their role?

3. Under IPI, roles and responsibilities need to be allocated and defined (e.g. Alliance Manager; Alliance Co-ordinator; Alliance Cost Managers; sub-group champions). What are your thoughts about role & responsibility management? How do your colleagues feel about role responsibility on the project?

4. Have the IPI managerial structures become better understood as Phase 1 has progressed? If no, why not? If yes, why/how has this happened?

Collaboration & Innovation

1. IPI aims to foster collaboration & innovation (i.e. through Behavioural workshops; Cultural Alignment workshops; team activities; FUSION principles; Activities planning; Value management work). What are your thoughts about collaboration & innovation so far on the project?

2. Can you see benefits (e.g. work duplication removal; co-location of workers; sharing of expertise) or drawbacks (e.g. communication breakdowns; co-ordination problems) to working with IPI as compared to other projects?

Cost & Risk

1. What are your thoughts about Cost planning so far on Advance2?

2. What are your thoughts about:
- The Initial Investment Target
- Development of a Target Cost Model
- Pain/Gain share mechanism
- Obtaining Insurer confidence in the numbers

3. Risk is not treated separately under IPI, but an allocated sum is assigned to major design risk issues at the end of Phase 1 (and agreed by all parties). How do you feel about risk management under the IPI model so far?

4. From your company`s perspective, how do you view the cost & risk management aspects of Advance2?

Financials & Insurance

1. Under IPI a project bank account is set up to facilitate payments. What do you think about payment mechanisms under IPI and how it is likely to work in practice?

2. Do you foresee any advantages/problems with payment mechanisms as we move forward from Phase 1?

3. IPI uses a commonly shared insurance indemnity for Alliance partners. Do you have any current thoughts about this?

4. Advance2 references Advance1 as a financial benchmark from which waste & inefficiencies may be cut. Do you have any opinions about using Advance1 as a benchmark for the project?

BIM & Technology Use

1. Do you see any advantages so far of IPI facilitating greater collaborative technology use (e.g. ADePT design planning tool; BIM). What comments do you have about this aspect of Advance2?

Overall working

1. IPI uses different terminologies (e.g. "Commercial Alignment"; "Phase 1, 2, 3") than other projects. Have these different terminologies affected you and your organisation?

2. How challenging has IPI been for you as a learning experience?

Outcomes & Success Criteria

1. On Advance2, IPI aims to make 20% savings by reducing waste/inefficiencies. What are your current thoughts about this aim (we are in Phase 1)?

2. How will your company assess if Advance2 has been a success?

University of Reading

July 2015

2C: Post-Project Interview Outline

Delivering more for less under the IPI model

Advance II – Post-completion review of project outcomes and the use of the IPI Model

Interview outline

Interviewer to outline the role of the University of Reading in the Innovate UK funded research project examining the use of the IPI Model on Advance II, and the purpose of the interview.

Project outcomes

Briefly, what do you think of the outcomes of the Advance II project in terms of:

1. Delivery to the project programme?
2. Delivery to the project target cost?
3. Overall quality of the completed building, and the extent to which the project met the client's 'success criteria'?
4. Any other important outcomes?

Other important outcomes could include: innovation, pioneering use of IPI, teamwork, use of BIM, Soft Landings, etc etc

The IPI Model overall

Overall, how would you describe your experience of working on Advance II?

To what extent was <u>your experience</u> of collaborative working among members of the IPT (Integrated Project Team) on Advance II any different to what you would normally experience working with design/construction team members on other construction projects of this size and type? In what ways?

Why do you think these differences arose?

What do you think were the major benefits of adopting the IPI Model, in terms of:

1. Your role
2. The overall project process
3. The main project outcomes outlined above?

And what you do you think were the major shortcomings, again in terms of:

1. Your role
2. The overall project process
3. The main project outcomes outlined above?

Aspects of the IPI Model

A number of people are being interviewed about the IPI Model on Advance II as part of this research. <u>From your perspective</u> were there any particular aspects of the IPI Model that you found problematic….

1. What were these?
2. What problems did they cause, and why?

Similarly, can you identify those aspects of the IPI Model that you found beneficial/useful …

1. What were these?
2. Who/what did they benefit, and how?

Overall, was there any one particular part of the process…(or person/firm/event/piece of information/other…) that was particularly problematic or beneficial? What/Who was that, and why do you think it/they was so significant?

Learning points and further development

From your perspective, what do you think are the key learning points from the adoption of IPI on Advance II?

Key learning points could arise in respect of…

a) *… overall process*
b) *… management arrangements*
c) *… procurement arrangements (for the selection of the IPT)*
d) *… contract arrangements*
e) *… insurance arrangements*
f) *… other*

Are there any other matters about your experience on Advance II, or about the project process or outcome that you think we should be aware of? What are these, and why are they significant?

Looking ahead

Would you consider providing/working under an IPI Policy on future construction projects?

What, if anything, would you like to change in terms of key aspects of the IPI Model on future projects? Why?

University of Reading

September 2017

2D: Lessons Learned Workshop Agenda

<u>Dudley Advance II – IPI Model Feedback day 16th August 2017</u>

<u>0930 - 1300</u>

<u>Agenda</u>

1. **Workshop Introduction**
2. **Expectations**
3. **Review of Processes**
   Suggested Headings – (TBA on day)
   a. **Contract**
   b. **Procurement**
   c. **Induction into IPI**
   d. **Waste and Inefficiency**
   e. **Cost/Resource Management**
   f. **BIM/information management**
   g. **IPT**
      i. **Meetings**
      ii. **Ownership**
      iii. **Reporting**
      iv. **Supply Chain**
   h. **Board**
      i. **Alliance Management**
      ii. **Decision making**
      iii. **Reporting**
   i. **Delivery**
      i. **Supply chain**
      ii. **Site matters**

4. **Breakout groups allocated debate**
5. **Feedback**
6. **Further Actions**
7. **Buffet Lunch**

APPENDIX 3: Advance II at Dudley College – Project Details

A. Advance II Strategic Brief (Revised November 2015)
B. Advance II Acceptance Criteria (December 2015)

3A: Advance II Strategic Brief and Success Criteria (Revised November 2015)

Advance II Revised Strategic Brief

Advance II Purpose

Advance II is intended to develop and expand training opportunities in advanced building and construction skills with an emphasis on BIM technologies. Accommodating over 500 students per year, it is expected that over 3,250 people will be trained across a wide range of programmes within the first five years of operation including full time, part-time and apprenticeship study. It is also required to accommodate approximately 35 staff.

Aspirations for the project are that it will unlock the productivity of the construction supply chain by closing the gap between design definition through BIM and the potential to use BIM to de-risk projects, increasing certainty of delivery whilst providing a basis for asset management. This should lead to the creation of a high performance building in terms of air-tightness, thermal envelope and low energy with natural day lighting and ventilation, providing a teaching environment which will act as an exemplar of new build construction.

Advance II Outcomes

Specific

- Total project cost should not exceed £11.685 million.
- Completion in the spring of 2017 at a cost which is below the agreed target cost.
- Build quality to give an exemplar to students and staff, with a high quality learning environment that inspires. The finished building should be a bright clean high tech environment mirroring the future of the construction industry it is trying to promote.
- Function over form to ensure the best possible facility for training within the investment target and the maximum possible delivery space is achieved within the envelope.
- Highly efficient methods, including off-site manufacturing and new methods of construction are adopted where ever 'best for project' in the design and delivery of Advance II, eliminating waste in materials, processes and procedures.
- It should create 20 apprentice positions and a live training environment for the college and its students as part of its construction.
- Leading BIM methods and technologies are adopted from commencement.
- Durability of the building making it robust, easy to maintain and clean, with lifecycle cost considered in all capital investment decisions.
- Design, delivery and operation of Advance II will engage all organisations in leading edge practices. All parties will promote their involvement and the successes achieved and provide legacy support to the educational functions to be delivered.
- The design should give flexibility for the facility to be remodelled to meet future changes in demands and training methods, rather than adaptability for short term change.
- Design aesthetics of the building must make a statement of its quality and that of the Dudley Learning Quarter.
- It should save 146 tCO_2e of carbon from the college's annual carbon footprint.
- Where possible local and regionally based staff, operatives and SME organisations will be involved in delivering the project.

- The construction site will be well organised and clean, highlighting the aspiration of the efficient procurement and construction methodology being used.
- Advance II is required to achieve an EPC A rating.
- Craft skills training to be accommodated in a separated environment to preserve the 'high Tech' space.
- Exemplar performance in respect of health, safety and environmental impact considerations of the project are expected as a matter of course.

Accommodation

- A large central multiskill workshop space (hanger) which is flexible, initially for the purpose of delivery of practical teaching and demonstration of 'off site manufacturing' and modern construction techniques including cladding and curtain walling. Area should effectively be a 'live site environment'.
- The hangar should have adequate means of taking delivery of and movement of offsite constructed building components including modular 'pod' systems. Sufficient space should be provided to allow erection and dismantling of an example structure.
- Up to 3 associated practical teaching rooms adjoining and with access to the multiskill workshop to allow theory and demonstration to be delivered prior to moving the 'live site environment'.
- An external practical area for cladding and steel erecting should be provided if space is available.
- A separate metalwork fabrication and construction tool making workshop. This to accommodate fabrication areas for metal section production, and CNC machining areas for delivery of tool making and production techniques. Welding is also to be included in this area.
- Mechanical and electrical teaching spaces (minimum three) for advanced construction courses at levels 3, 4 and 5, to take group sizes of up to 20.
- A suite of IT areas/rooms (minimum three) capable of delivering digital technologies, and BIM.
- Minimal general teaching spaces are required, as the facility will operate in co-ordination with Advance I for timetabling purposes.
- A training and demonstration area for carbon friendly technologies, and design techniques, with working examples on an adjacent section of the building, including PV's and Air source heat pumps.
- A central 'iPoint' learning zone for 40 students.
- Staff rooming for 30 staff, spread throughout the building, preferred 1 single person staffrooms, and 2 or 3 rooms to accommodate the remainder.
- A 'grab and go' social space serviced by vending machines for 45 students.

General

- General group size for students is 16 in a practical environment, and teaching rooms should be able to take classes of 20 though some flexibility on rooms to accommodate different group sizes from 16 to 26 is required.
- Floors should be as open and flexible as possible, with any division to form discrete spaces made for compliance or operational needs only.

- It should be a statement building distinctly different from the Advance I and Enhance buildings.
- The building needs to have a visible presence from Priory Road.
- The building should be designed so as to minimise the amount of forced ventilation, heating and cooling to minimise costs in use
- The facility should include examples of modern methods of construction with elements suitable for "dismantle and discover" demonstrations to support the learning environment.
- The building should have as much 'show and tell' examples of construction methods within it as possible. Multi structural solutions preferred where possible and 'best for project'.
- The north and visible sections of the east elevations are to have the statement treatments, including a large glazed area allow a 'showroom window' onto the hangar.
- The Advance I building will form the main reception for both Advance I and II buildings.
- Sufficient external space is required to allow any visitor parking planning restrictions will allow, and a delivery and turn facility for articulated lorries for deliveries.
- The principles of BREEAM and Passivhaus are to be considered and adopted where they are economically viable, and represent good practice, but accreditation is not required.
- Disruption to the day to day operation of Dudley College will be minimised and in particular the impact of project related noise during exam periods will be evaluated and factored into planning and programming.

Finishes and Fittings

- The college would seek to use standard materials and fittings though the building wherever possible to make maintenance and replacement easier. The finishes on the Advance I project should be used as a basis on specification of material and finishes, i.e. trunking and light fittings, ironmongery, and floor finishes.
- The college will co-ordinate the ordering and installation fixtures fittings and furniture directly with suppliers, including fire extinguishers, evac chairs, sani bins, notice boards, and machinery, but excluding mirrors, and hand dryers.
- Locks are sourced from a licenced suite, and will be ordered and supplied by the college for fitting by others.
- All PC's, network servers are to be ordered and fitted by the college. Main network cabling termination points and sockets by others.

3B: Advance II acceptance criteria (December 2015)

Area	Element	Criteria	Evidence	Lead
External	Drainage	Tested for leakage, discharges, flow, certified	Test certificate. CCTV survey,	SM
	Surfaces	No ponding	Visual inspection	SM
		Even finish with no tripping hazards	Visual inspection	SM
	Lighting	Lux Levels and daylight control in accordance with CIBSE lighting guide 06	Test certificate.	DBS
		Lighting provided to give sufficient lux levels for CCTV when movement detected out of hours.	Site inspection and test	DBS
Building Fabric	Water tightness	Walling	No visible leaks	SM
		Windows	No visible leaks	SM
		Roof certified by installer, no visible leaks.	Installation certificate guarantee visual inspection	SM
	Air tightness	Less than 3 test certified by independent consultant.	Test certificate	SM
	Rooms areas	As per agreed plan and room data sheets	Visual inspection and measurement	SM
		Occupancy usage figures as strategic brief	Visual inspection	Metz
	Natural Ventilation	Ventilation to occupied spaces to limit the average concentration of carbon dioxide during the occupied period to less than 1500ppm. Also the maximum concentration is not to exceed 2000ppm for more than 20 minutes each day	Completed build as designed. Confirmation during proving period	Fulcro
	Materials and construction	All materials as design with relevant certification and warranties provided to collaborate quality, i.e. glazing manufacturer certification	Certificates provided	

Mechanical	Electrics	Certificate of compliance, installation in accordance with IEE wiring Regulations BS EN 7671. Sufficient power to accommodate usage in rooms without tripping circuits, with a minimum 20% spare capacity on design load	IEE installation test certificate. Operational tests on site	DBS
and	Heating and cooling	Heating to provide a minimum dry resultant temperature of 19 to 21 degrees C (Winter) in Teaching Spaces, Breakout Areas, Circulation Spaces & WCs. To BISRIA proving criteria	Commissioning test and theoretical test on installed systems	DBS
Electrical		To limit internal overheating, summer-time internal thermal performance to be in-line with CIBSE TM52: Building to be Class 2 "Normal expectation". For Criterion 1; 3% exceedance should be used. For Criterion 2; weighted exceedance </= 6. For Criterion 3; Maximum exceedance </= 4K.	Design stage TM52 study & report. Post-occupancy surveys - TM52 suggests: < 20% of occupants to report overheating for a satisfactory environment.	DBS
	Thermal Comfort	CIBSE adaptive comfort room temperature +/- 2 degrees C < 1% of occupied hours. August to be omitted form measure	Post-occupancy surveys - TM52 suggests: < 20% of occupants to report overheating for a satisfactory environment.	DBS
	Mechanical Ventilation	Extract ventilation to WCs & Cleaner's Stores to provide 6ACH.	Installation certificate, test inspection	DBS
		LEV providing extract ventilation as required by risk assessment	LEV test certificate	DBS
	Gas	installed and certified, no leaks compliant installation	Test certificate, visual inspection, signage and pipe markings in place	DBS

	Water	Cold water system designed, installed, flushed & pressure tested in-line with BS EN 806 and the water regulations. No leaks.	Test certificates, Pressure test, flushing & water sample results.	DBS
		Hot water systems designed, installed, flushed & pressure tested in-line with BS EN 806 and the water regulations. No leaks, Water temperatures sufficient to meet legionella requirements. Mixer taps provide 40 degrees C max at draw points.	Test certificates Pressure test, flushing & water sample results.	DBS
	Compressed air	Installed and certified, no leaks compliant installation, with pressure sufficient to run installed machines.	Test certificate, visual inspection, signage and pipe markings in place, installed machines operate as required	DBS
	Lighting	Lux levels as design criteria. Lighting lux levels in line with CIBSE Lighting Guide 05.	Inspection and testing in completed building	DBS
		Computer Screen glare to be in line with CIBSE Lighting Guidance..	Visual check on completion. Lighting units installed as design	DBS
		Installation does not provide any frequency issues with machines and welding when is operation. Harmonic filtration issues addressed	Visual inspection. Certificate of completed installation as design	DBS
		Movement detectors fitted to turn lights off after 15 minutes un-occupied	Visual inspection. Certificate of installation completed as design	DBS
	Fire Alarm	Installed to L2 specification and installation certified. Audible in all parts of building and externally to above minimum required statutory standard	Installation certificate. Site check for audibility in key locations	DBS

		90 second intermittent sounder upon activation to allow cancellation of false activations, turning to full sounder if not cancelled	System testing	DBS
		Fire alarm linked to 'Deaf Alerta' pager system for DDA compliance	System test certificate	DBS
	Emergency lighting	Emergency Lighting in-line with CIBSE Lighting Guidance, lux levels above the minimum legal lumens, test system in place as agreed specification.	Test certificate	DBS
	Burglar alarm	Installed to PD6662:2010 standard, level 1.	Test certificate	DBS
	CCTV installation	Installed system covering all external elevations, all external entrances, and all entrance exits to each floor, and public congregation areas. Recording system accessible over college internet system with secure user login	Installation certificate	DBS
	Lighting Protection	Lighting conductor fitted to building compliant with BS EN 62305	Installation test certificate	DBS
	Building managements system	Operational with control as design	Commissioning & testing certificate.	DBS
	System Operations	System Operational interphases operating as agreed criteria	Commissioning & testing certificate.	DBS
Operational	Thermal Comfort	Thermal modelling using CIBSE Design Summer Year (DSY) to support Overheating Risk Analysis for < 3% of occupied hours.	TABS system commissioning results. Design stage TM52 study & report. Post-occupancy surveys - TM52 suggests: < 20% of occupants to report overheating for a satisfactory environment.	DBS

	Ventilation and Drafts	Windows able to be opened to trickle vent setting, to minimise drafts in cold weather .	CIBSE AM10 criteria compliance confirmed	SM
		No draft from main entrance door which lowers the temperature of the reception area below 20 degrees C for more than 5 minutes following door being in constant use for 10 minutes	Inspection and site test	DBS
	Operational costs	Energy use to be within 3% of predicted usage figure on commissioning test	Commissioning certificates confirming actual operational criteria against design	DBS
		EPC rating of A on test at completion	Commissioning certificates confirming actual operational criteria against design	DBS
	Carbon emission	Total Carbon output no more than 416 tCO2e	Commissioning certificates confirming actual operational criteria against design	DBS
Special installations	Lift	Lift installed and operational to LOLER requirements all to comply with BS EN 81–20 and EN 81–50	Installation certificates	SM
	Crane	Installed and operational to LOLER requirements all to comply with BS relevant to selected solution	Installation and test certificates	SM
General	Quality and Defects	No major defects at handover or during proving period that materially affect the use and occupation of the building	Site inspection and testing. Commissioning certificates	SM
		All work completed in a good workman like manner	Site inspection and testing. Commissioning certificates	SM
	Occupier use	Full staff and user training completed to allow use and operation of the building and its systems	Training record	SM

		Specialist training completed in operation of specialist systems, including Fire and Burglar alarms, BMS system, plant operation.	Training record	DBS
		Full set of operation and maintenance manuals in electronic and paper form handed to client within 14 days of occupation.	Receipt of documents, and confirmation of accuracy by consultant	SM
	Legal	Building compliant with all legislation at handover, including Planning requirements, Building Control approval, Fire Risk Assessments and statutory authority regulations	Receipt of relevant certificates	Metz
		The building should be fully DDA compliant as completed for access, use and safety	Visual inspection and relevant certifications	SM
	Safety	All safety features as designed in place and fully working at handover , with all necessary certification provided.	Site inspection and installation certificates	SM
		Full CDM compliant documentation provided at completion	Receipt of documents, and confirmation of accuracy by consultant	SM
	Documentation and information	Full set of operation and maintenance manuals in electronic and paper form handed to client at handover.	Receipt of documents, and confirmation of accuracy by consultant	SM
		All certification as legally required to show compliance with relevant ISO standards and legal requirements	Receipt of documents, and confirmation of accuracy by consultant	SM
		Full level 2 BIM model suitable for future facilities management use, but initially to be used as a teaching aid	Receipt of operational model	Fulcro

APPENDIX 4: Advance II Cost Breakdown and Summary of FIRA Reporting

Development of the Investment Target and the Target Outturn Cost, Phase 1

	Investment Target	Cost Plan									
		2015									**2016**
		29-Jun	18-Sep	01-Oct	11-Oct	26-Oct	17-Nov	24-Nov	02-Dec	16-Dec	19-Jan
Co-ordination & Fees*	£2,552,000	£2,869,917	£2,802,000	£2,802,000	£2,802,000	£2,544,296	£2,544,296	£2,544,296	£2,547,768	£2,620,185	£2,620,185
Fees						£216,061	£216,061	£216,061	£156,866	£171,216	£171,216
People Cost						£706,758	£706,758	£706,758	£1,215,873	£1,255,885	£1,255,885
Ring Fenced Sum						£1,294,351	£1,294,351	£1,294,351	£847,903	£874,516	£874,516
IPI Costs						£327,126	£327,126	£327,126	£327,126	£318,568	£318,568
Construction Costs**	£7,658,000	£8,193,949	£6,744,468	£7,400,064	£7,894,496	£7,303,817	£7,659,514	£7,536,822	£7,112,086	£7,099,467	£7,098,467
Target Outturn Cost***										£9,991,652	£9,990,652
Fixtures & Fitting-Out	£900,000	£1,500,000	£1,500,000	£1,500,000	£1,500,000	£1,500,000	£1,500,000	£1,500,000	£1,500,000	£1,250,000	£1,250,000
Land	£325,000	£325,000	£330,000	£330,000	£330,000	£330,000	£330,000	£330,000	£355,000	£355,000	£355,000
VAT	£250,000	£250,000	£550,000	£550,000	£550,000	£550,000	£550,000	£550,000	£550,000	£522,000	£522,000
Drainage diversion										-£161,000	-£160,000
Investment Target/Forecast cost	£11,685,000	£13,138,866	£11,926,468	£12,582,064	£13,076,496	£12,228,113	£12,583,810	£12,461,118	£12,064,854	£11,685,652	£11,685,652

* From 26 Oct onwards, a more detaild breakdown was provided. The total is shown for comparison with earlier sums for this category

** includes Opportunity/ Risk	Risk amounts are:	£1,426,573	n/a	n/a	£1,482,029	£1,214,084	£1,132,990	£787,364	£547,600	£552,068	£552,068

* ** Target Outturn Cost was identifed from Dec 2015 onwards; the total shown includes £272k of the total VAT provison of £550K for VAT on construction cost and fees

Achievement of the Target Outturn Cost, Phase 2

Based on selected FIRA Reports

	Target Outturn FIRA Rpt Jan 2016	FIRA Reports Variance from Jan 2016 Totals							
		2016		**2017**					
		August	November	January	April	June	July		December (Provisional)
Construction	£6,346,000	£3,151	£9,299	£303,407	£307,331	£300,515	£315,230		
Risks and Opportunities	£552,068	-£134,491	-£491,767	-£562,176	-£481,439	-£475,240	-£545,407		
College Fixtures and Fittings	£200,000								
Fees	£1,427,101	£21,982	£80,998	£95,711	£135,711	£158,918	£166,918		
Overheads and Profit	£874,516								
Third Party Gain Share	£25,000								
IPI Costs	£293,568	£108,868	£118,868	£128,868	£138,868	£138,868	£187,844		
VAT	£272,000								
Rounding provision	£399	-£399	-£399	-£399	-£399	-£399	-£399		
Target Outturn Cost	£9,990,652								
Drainage diversion	-£160,000			£127,125	£127,125	£127,125	£127,125		
Adjusted (Forecast)Target Outturn Cost	£9,830,652	£9,829,763	£9,547,651	£9,923,188	£10,057,849	£10,080,439	£10,081,963		£9,948,652
Forecast over original (Dark red is increase)		-£889	-£283,001	£92,536	£227,197	£249,787	£251,311		

APPENDIX 5: IPI Commercial Model and Gain/Pain Share Mechanism

A. Guidelines for the calculation of Overheads and Profit prepared by IPInitiatives
B. Gain/Pain Share – Interactive Tool for Advance II. March 2017
C. Gain/Pain Share – Interactive Tool for Advance II. July 2017

5A: Guidelines for the calculation of Overheads and Profit prepared by IPInitiatives

DUDLEY COLLEGE CABTech

IPI Model – Company Overheads & Profit

Salaried staff deployed on projects are the "key resource" of an organisation whether consultant, specialist, constructor or "project co-ordinator". Under the IPI model company overheads and profit are allocated as a % on those salaried staff: company overhead as the off-site support, and profit as their profit-earning power.

Under the IPI model this percentage is not part of the competition: but it has to be "appropriate" to the category of organisation, and neither too high nor too low.

How should each organisation calculate its OH&P for application under the IPI commercial model? It is suggested:

(1) Take the most recent year's or years' Management Accounts for the whole organisation or the relevant part (if more appropriate);

(2) Extract "A" the total cost of the salaried staff directly deployed on all projects, making sure to include those salaried staff who may be elsewhere in the Accounts but are of a category (e.g. design and estimating staff, and other functional staff who directly service projects) that would be paid for as direct cost under the IPI Commercial Model;

(3) Extract "B" the cost of all the Company Overheads, making sure to exclude:

   a. all categories of cost that would be paid for as Direct Cost under the IPI Commercial Model (e.g. the salaried staff above)

   b. any other category of cost that would be paid for directly under the IPI Commercial Model (e.g. insurances);

(4) Extract "C" the profit;

(5) The OH&P % to be used in the IPI Commercial Model is then

$$\frac{B+C}{A} \times 100$$

which is then applied to the salaried staff directly deployed and paid for as Direct Cost on the Dudley College CABTech project;

(6) On this basis each organisation will receive the appropriate Company Overheads and Profit relating to its salaried staff

- guesstimated at the beginning of Phase 1 of the Alliance Contract (giving collectively a "first pass" of the total Ring Fenced Sum)
- agreed at the end of Phase 1 (giving, subject to any justified adjustments, collectively the fixed Ring Fence Sum)

(7) Be ready to evidence the above data "open book" but in confidence if requested.

If any organisation completing an ITT for a pilot IPI project is in doubt about the exact application of the above in its circumstances, clarification should be sought in accordance with the procurement proprieties.

5B: Gain/Pain Share – Interactive Tool for Advance II. March 2017

Integrated Project Insurance®

IPI Interactive Incentive Calculation Tool

CLIENT RISK

INSURER RISK

A B C D E F G H I J

A B C D E F G H I J

CLIENT COST (Includes Profit & O/H)

Insurance Cap	£ 12,420,652		Client Risk	Outcome £ -
FL Cover	£ 2,000,000		FL Payment	£ -
Initial P/sh Limit	£ 10,220,652	Pain/sh Limit £ 590,000		
Initial Painshare	£ 390,000	Co Pain/sh % 10.0	FL Painshare	£ 57,043
Target Cost	£ 9,830,652	Max Cost £ 9,940,392	Actual Cost	£ 9,887,695
Gainshare	£ 750,000		Gainshare	£ -
Gainshare Limit	£ 9,080,652		Excluded Saving	£ -

Success Criteria (SC): Cost | Time

Performance Measure: Below Target Cost | Before Target Date

SC % Split: 75 | 25

Time Adjusted SC: 0% | 0%

Date Criteria

Critical Need	21/07/2017
Transition	30/06/2017
Target	02/06/2017
Completion	24/07/2017
Outstanding Ps invoked	100%

Alliance Members Gainshare and Painshare Schedule

Ref	Party	% Share	Gain Limit	Pain Limit	Financial Outcome
A		18.6	£ 139,500	£ 109,740	£10,610
B		18.6	£ 139,500	£ 109,740	£109,740
C		18.6	£ 139,500	£ 109,740	£109,740
D		18.6	£ 139,500	£ 109,740	£109,740
E		7.0	£ 52,500	£ 41,300	£41,300
F		18.6	£ 139,500	£ 109,740	£109,740
G	Partner 6		£ -	£ -	£0
H	Partner 7		£ -	£ -	£0
I	Partner 8		£ -	£ -	£0
J	Partner 9		£ -	£ -	£0
			Retained by or returned to Client		£433,827
	Check Totals	100.0%	£750,000	£590,000	In Delay Painshare

5C: Gain/Pain Share – Interactive Tool for Advance II. July 2017

Integrated Project Insurance®

IPI Interactive Incentive Calculation Tool

CLIENT RISK

INSURER RISK

A B C D E F G H I J

A B C D E F G H I J

CLIENT COST (Includes Profit & O/H)

			Client Risk	Outcome £ -	
Insurance Cap	£ 12,420,652				
FL Cover	£ 2,000,000		FL Payment	£ -	
Initial P/sh Limit	£ 10,220,652	Pain/sh Limit £ 590,000			
Initial Painshare	£ 390,000	Co Pain/sh % 10.0	FL Painshare	£ 251,310	
Target Cost	£ 9,830,652	Max Cost £ 9,940,392	Actual Cost	£ 10,081,962	
Gainshare	£ 750,000		Gainshare	£ -	
Gainshare Limit	£ 9,080,652		Excluded Saving	£ -	

Success Criteria (SC): Cost | Time

Performance Measure: Below Target Cost | Before Target Date

SC % Split: 75 | 25

Time Adjusted SC: 0% | 0%

Date Criteria

Critical Need	21/08/2017
Transition	18/08/2017
Target	21/07/2017
Completion	11/08/2017
Outstanding Ps invoked	0%

Alliance Members Gainshare and Painshare Schedule

Ref	Party	% Share	Gain Limit	Pain Limit	Financial Outcome
A		18.6	£ 139,500	£ 109,740	£46,744
B		18.6	£ 139,500	£ 109,740	£46,744
C		18.6	£ 139,500	£ 109,740	£46,744
D		18.6	£ 139,500	£ 109,740	£46,744
E		7.0	£ 52,500	£ 41,300	£17,592
F		18.6	£ 139,500	£ 109,740	£46,744
G	Partner 6		£ -	£ -	£0
H	Partner 7		£ -	£ -	£0
I	Partner 8		£ -	£ -	£0
J	Partner 9		£ -	£ -	£0
			Retained by or returned to Client		£0
Check Totals		100.0%	£750,000	£590,000	£251,310

APPENDIX 6: Alliance Contract – illustrative extracts

A. Alliance Board Duties
B. Alliance Manager Duties
C. Alliance Cost Manager Duties

6A: Alliance Board Duties (Extract from Alliance Contract Annex)

Alliance Board meetings – general

(1) The Alliance Board holds meetings at Monthly intervals or whenever requested in writing by an *Alliance Member*. Unless otherwise agreed by the *Alliance Members* a representative of the *Employer* chairs the meetings and invites others to attend and speak (but not vote) including the *Alliance Manager*, the *independent facilitator* and the *independent risk assurers*.

(2) The quorum at meetings of the Alliance Board is one representative appointed by each *Alliance Member*. All decisions are made unanimously. The Alliance Board may from time to time pass resolutions regulating the conduct of its own affairs provided such resolutions do not conflict with this contract or the *Alliance Principles*

(3) A representative who is unable to attend a meeting of the Alliance Board may appoint an alternate to act in his absence.

If invited to do so by the *Employer*, Insurers may also appoint a representative

In the absence of any other agreement, the Alliance Board functions are as follows:

- To ensure compliance with the *Alliance Principles*
- To be responsible for the overall strategic direction and control of the *Alliance*
- To act as the governing body for the administration of the *Alliance* contract
- To appoint and dismiss the *Alliance Manager* and *Alliance Cost Manager* (if applicable).
- To approve the bank mandate for the Project Bank Account and the authorised signatories on the account
- To approve Project Execution Plans.
- To approve the documents referred to in Clause 3.4.1 of the *Alliance* conditions of contract and authorise their signature as contract documents.
- To ensure that the recommendations of the *Independent facilitator* and *independent risk assurers* are properly considered by the Alliance, including any recommendation which if not implemented, may lead to coverage under the IPI Policy being modified, restricted or excluded.
- To consider any proposed change to the Strategic Brief or Success Criteria.
- To consider when Completion has taken place, and authorise the *Alliance Manager* to certify accordingly
- To monitor overall performance of the IPT against the Success Criteria.
- To approve the final outturn cost and Incentives calculations and the certificates prepared by the *Alliance Manager*.
- To approve any proposed payment *under the incentive scheme* set out in the Commercial Model.
- To consider any proposed claim under the IPI Policy.
- To approve any proposal to admit a new *Alliance Member.*
- To decide what action to take and adjust the Alliance information and/or Commercial Model incentive data pursuant to Clause 3.7.3 of the Alliance conditions of contract following a Review Event.
- To consider any latent defect in the *project* discovered after Completion if required to do so.
- To resolve and/or assist in resolving any dispute between the *Alliance Members* and/or Suppliers.

6B: Alliance Manager Duties (Extract from Alliance Contract Annex)

The primary responsibility of the Alliance Manager is the day to day management of the *Alliance* and to achieve the Best for Project Outcome in accordance with the *Alliance Principles*.

- To be responsible for the general management and control of the delivery of the *project* on a day-to-day basis.
- To select and establish the IPT for the delivery of the *project*, in consultation with the *independent facilitator* and *independent risk assurers*, on a 'best person for the job' basis and submit a proposal to the Alliance Board for approval.
- To make such changes to the IPT as may be necessary during the course of the *project* after consultation with the *independent facilitator* and *Independent risk assurers* and subject to the approval of the Alliance Board.
- To ensure that all the members of the IPT:
  - adhere to the *Alliance Principles*;
  - work collaboratively as an integrated team;
  - reach their decisions collectively; and
  - adhere to the 'no blame/no claim' culture required by the Alliance conditions of contract.
- To be responsible for the performance of the IPT, measuring performance against cost, quality, programme and other behavioural measures approved by the Alliance Board.
- To liaise with the *Alliance Cost Manager* or, failing his appointment, to perform his duties
- To co-operate with the *independent facilitator* and *independent risk assurers* ensuring that they are provided with such information, data and facilities as they may reasonably require for the performance of their duties.
- To implement a policy across the IPT of continuous improvement, driving out waste and inefficiencies in every form, which embraces innovative design solutions without insistence upon intellectual property rights.
- To ensure that all decisions are made on a Best for Project Outcome.
- To submit regular progress reports to the Alliance Board as required and to attend and speak at board meetings when required.
- To consider beneficial scope switching between the *Alliance Members* and Suppliers for approval by the Alliance Board.
- To manage the contractual interfaces between the *Alliance Members* and Suppliers.
- To consider any proposed change to the Strategic Brief and Success Criteria and submit proposals to the Alliance Board for approval.
- To ensure compliance by the IPT with all statutory requirements and mandatory codes and standards.
- To ensure that all applicable health, safety, environmental and quality requirements are complied with by the IPT.
- To carry out such other duties relating to the management and control of the *project* as may be delegated to him by the Alliance Board.

6C: Alliance Cost Manager Duties (Extract from Alliance Contract Annex)

The primary responsibility of the Alliance Cost Manager is to maintain the books of account and records of the *Alliance* and ensure that all payments are properly made in and out of the Project Bank Account.

- To maintain on an open book basis the *Alliance* books of account and records.
- To negotiate the terms of the mandate for the Project Bank Account and submit the same to the Alliance Board for approval.
- To ensure that all payments (including payments from the IPI Policy) due to the *Alliance Members* and Suppliers are properly made through the Project Bank Account in accordance with the approved bank mandate.
- To prepare a forecast expenditure profile that can be used for cost control/cash-flow purposes for approval by the Alliance Board and once approved, to maintain the profile in accordance with actual and planned expenditure.
- To submit such financial and other reports to the Alliance Board as may from time to time be required in a format approved by it.
- To retain on a confidential basis cost information provided by the *Alliance Members* identified as confidential by the relevant *Alliance Member* where such information is required for the calculation of payments due under the contract.
- To co-operate with the *financial independent risk assurer* and provide him with such information, data and facilities as he may reasonably require for the performance of his duties.
- To approve payment applications submitted on behalf of the *Alliance Members* and to assess amounts due in consultation with the *financial independent risk assurer*.
- To ensure that all payments due are properly made through the Project Bank Account in accordance with the contractual entitlements of *Alliance Members* and Suppliers.
- To provide the *Alliance Members* with copies of bank statements and other correspondence with the Bank relating to the operation of the Project Bank Account.
- To answer queries from the *Alliance Members* and Suppliers concerning their entitlement to payments and the operation of the Project Bank Account.
- To co-operate with the *financial independent risk assurer* concerning the ascertainment of the final outturn cost.
- To consider and approve with the Insurers the certificates and calculations submitted by the *financial independent risk assurer* relating to the final outturn cost and final gain/pain share payment in respect of the achievement/non-achievement of the target outturn cost.
- To submit proposals to the Alliance Board regarding the making of any payment under the incentive scheme set out in the Commercial Model.
- To carry out such other duties relating to the maintenance of the *project* books of account and records and operation of the Project Bank Account as may be delegated to him by the Alliance Board

APPENDIX 7: Collaborative working on Advance II – IF reporting

Extracts from selected IF reports on Collaborative working against FUSION principles, Phase 2

FUSION Principles	Report June 2016	Report November 2016	Report January 2017	Report March 2017	Report July 2017
Fairness – Inclusivity, listen & hear, objective, ethical Fairness	Reported overspending of man-hours has identified some differences in attitude towards the commitment to stay within planned resource budgets.	We are continuing to witness traditional behaviours emerging from time to time but have begun to see a transition in a number of key team member's whereby they self-moderate without needing our intervention	We have enjoyed watching the team continue to … [be] comfortable to confront issues and include the right people in decision making. …they treat all opinions from any source as valid and listen well. However, much of the good work …is instigated by key members of the team it will be nice to see more engagement from all parties	The team display fairness when dealing with issues and concerns. However, all team members need to review the cost plan together. The inclusion of the site team is much better and we are pleased to see the incentivisation for individuals and subcontract teams on site is now up and running	The team continues to display fairness … and is consistently inclusive, objective and ethical. …The whole team at various times have struggled with some decisions and some have been more inclusive than others but in general the contract has assisted in driving the continued inclusive behaviours.
Unity – Consensus, common goal, supportive	The recent Build in a Day (BINAD) workshop was well attended … there was a clear project first focus displayed. Indeed it was one of the suppliers who noted the "all for one and one for all" nature of the project.	With the site team beginning to build up it is clear that relationships would benefit from further behavioural workshops .. these are planned for early in the new year.	As the site team continues to build… key members … are taking on much of the work load. Methods to include more members of the team have been discussed and agreed to give support to those on site. This is being trialled in the next period with behavioural support from the IF	In general, the team work well together. It has been good to view the site team members unifying better in the last period. … the inclusion of the site team at the open day should be built upon and enhanced. If we are more unified on site we will get better reliance on the teams …	Throughout the whole project the team have worked to a common goal and the extent to which decisions have been made on a "best for project" basis have, on occasion, overridden commercial, design and programme parameters i.e. the team have "over delivered".

Seamless – Not constrained by personal or organisational processes or boundaries	Changing culture is very difficult and occasionally residual 'Design and Construction' attitudes surface. This is mostly confined to issues that have been identified and are being addressed.	A number of members of the InnovateUK [Research Consortium] team commented on the cohesion of the Alliance and IPT when they met for the review workshop. …it is good to see how well the IPT in particular is grasping issues and seeking resolution	For a few months now the team has shown itself in the wider IPT to work as one unit to resolve issues. As problems arise on site for the delivery team, it is not surprising that key individuals feel that much of the pressure is upon them to deliver.	Last month we reported that the team appeared seamless and had worked well together to resolve issues where one specific team member was suffering with resource issues brought about by a "squeezed" programme. … having seen the latest board report, …will be a shock for many team members suggesting that there is a split in the sharing of information in good time.	… when listening to various members of the Board and IPT and wider site there is common use of the word "we" … [ie] the whole team. Some of the concerns of individual members and their contributions are not always heard. The approach demonstrated by the core team has not always translated to the supervisory site level…some but not all on site have bought into.. IPI
Innovative – Challenge the norm, encourage each other, value each other	The team has invested a lot of time and energy in developing new processes and procedures which support collaborative working under the IPI Model.	The soft landings process has been addressed during November, but…the team has been faced with the timeline challenge of effective completion being accommodated into the existing timeline	The soft landings process continues and the effect of addressing this correctly within SOI is recognised. Without adding extra processes, the team agreed to change the methods for look ahead reviews…The thinking is innovative and should enhance time saving….	The open day highlighted areas where the team considered innovations had better helped them run the project and we are joining InnovateUK on 17th May to consider lessons learnt. …many of these innovations have been hard work and resource heavy.	Some of the best innovations at Advance II have been the methods the team have used to reach decisions and the processes used to innovate or solve issues. The team have shown willingness to challenge the norm on a consistent basis… striving to move forward in proceeding with ideas instead of sitting back and waiting for information.

Open – Honesty, be approachable, be receptive	The discussions with specialists and suppliers at the BINAD workshop showed how well the culture of openness has already become embedded with the wider team.	Both facilitators are being consulted about issues which need to be addressed which is positive, but we now need to see more confidence displayed in intervention without the need to seek advice first.	Key members of both the IPT on the Board are now comfortable with being open and honest in discussing any issues concerns. It is essential that this spirit is engendered across the whole site… the team of reviewing having wider site meetings on a regular basis to encourage site personnel across a much wider team to feel comfortable with the same approach.	We reported last month that both the IPT and the board, have long been comfortable with being open and honest …. Meetings are now much more efficient. However, there are some specific challenges…[eg] steel frame fire protection to hangar; M&E and other increased costs. Costs should be stable at this stage … the specialist supply chain do not have buy in to the IPI Model.	People throughout the project timeline have always been approachable, open and receptive but some have taken longer to react to situations than others. Honesty on a business level has been to the fore but some members of the IPT and Alliance may feel that despite their openness they have not received the responses they want….
No Blame – Be accountable, resolving problems without recrimination	The responses to [XX's] email preceding the information flow process development showed that the team is robust and confident enough to accept criticism without resorting to recrimination or blame.	Both the programme and ongoing cost challenges have the potential to lead to blame based behaviour, but team members continues to avoid falling into this pattern of behaviour.	Both the programme and ongoing cost challenges continue to have the potential to lead to blame based behaviour, but team members remain focussed on resolution and best for project solutions. Where the supply chain [is] struggling it is more difficult to avoid traditional behaviours. The main team, however, is attempting to instil the same ethos across the supply chain.	As we get nearer to .. where all packages should have stabilised opportunity & risk … we lose the ability to mitigate any cost increases. Recently raised design, programme and ongoing cost challenges continue to have the potential to lead to blame based behaviour. .. evident is the speed of recovery from setbacks showing how ingrained the no blame culture is becoming.	The No Blame aspect of the contract itself has certainly driven the "best for project" behaviour and solutions. … there is an element of being accountable for mistakes that is also part of the No Blame culture. …where businesses that have caused time or financial distress to the project where risk is held by the Alliance could be approached in an open fashion…

APPENDIX 8: Constructing Excellence Teamworking Matrix






	Team identity	Shared vision	Communication	Collaboration and participation	Issue negotiation and resolution	Reflection and self-assessment
Level 4	The team takes ownership of the problem and accepts joint responsibility for its achievement	The team has a shared vision and set of objectives, developed collaboratively and regularly reviewed	Team members actively and openly share their knowledge and ideas around the whole team	Familiarity, honesty, mutual trust and full participation harness the collective expertise of the team	Divergent views are welcomed as a source of energy and a spur to the team's creative problem-solving	The team regularly reviews members' roles and their impact on the team and acts on the outcome
Level 3	The team recognises that its members have individual and team goals and tasks are framed accordingly	The team has developed for itself both a shared vision and clear objectives	Team members communicate information and knowledge freely around the team	All members are given opportunities to contribute and build on suggestions from others	Sources of disagreement are addressed openly and resolved head-on through constructive negotiation	The effect on the team of each member's different roles and responsibilities is clearly recognised and discussed
Level 2	The focus of the team is on the tasks that individual members need to solve	The whole team is working to a set of common objectives	Team members communicate information when others need it	The team seeks ideas, proposals and solutions from all its members	Team members are prepared to explain their underlying assumptions and negotiate options	Different roles and responsibilities are discussed from time to time
Level 1	Team members take limited interest in issues that lie outside their own immediate area of responsibility	Members of the team are clear about their own objectives but the team has no shared vision	Individuals are protective of their own information and share it reluctantly in response to specific requests	Team members prefer to work alone and give more priority to their own concerns than to those of the team	Contentious issues are skated over or avoided completely; conflict is dealt with only superficially	The team acknowledges its members have several roles and responsibilities but they are not reviewed
Level 0	Team members concern themselves only with their own responsibilities	Team members, both individually and collectively, lack a common vision and clear objectives	Information is passed to team members strictly on a 'need to know' basis	Insularity, lack of trust or power struggles reduce participation and collaboration	Conflicting opinions remain unaddressed and consequently slow progress	The team places no value on considering and negotiating how they work together

You may photocopy the matrix and distribute it among your team members.

Source: Eclipse Consultants, 2004 (Constructing Excellence)

APPENDIX 9: Summary of TIRA Reporting

Report 3*/Jan 2016	Report 4/Jun 2016	Report 10/Feb 2017	Report 11/Mar 2017	Report 13/July 2017
Structure • Queries about movement between structure and floor slab	Structure • Queries about hangar crane loading • Queries about steel frame connections	Structure • Queries about hangar crane loading (being resolved by IPT) • Queries on bearings for column joints in steel frame	Structure • Queries about hangar crane loading (being resolved by IPT)	Structure • Queries about loading scheme for the crane to support calculate of bridge girders
Architecture • Need for faced to ensure acceptable comfort conditions (via provision of opening elements, etc)	Architecture • Need for faced to ensure acceptable comfort conditions • Query about specification for acoustic performance of facade	Architecture • Need for faced to ensure acceptable comfort conditions • Query on insulation provision at interface between cladding and internal partitions	Architecture • Need for faced to ensure acceptable comfort conditions (being addressed by IPT) • Query on insulation provision at interface between cladding and internal partitions (being addressed by cladding SC)	Architecture • Query on entrance canopy structure • Query on DPM/DPC detail
HVAC • Clarifies need for clear acceptance criteria for ventilation, heating and cooling performance	HVAC • Notes acceptance criteria for ventilation, heating and cooling performance • Notes that thermal modelling is not complete	HVAC • Notes acceptance criteria for ventilation, heating and cooling performance • Suggests mechanical ventilation would best deal with CO2 levels	HVAC • Notes acceptance criteria for ventilation, heating and cooling performance • Query on difference between night and morning purging strategy	HVAC • Notes acceptance criteria for ventilation, heating and cooling performance • Notes previous query on night/morning purging now resolved
Technical installations n/a	Technical installations • Query about lack of mechanical ventilation in teaching areas	Technical installations • Notes some potential performance issues with natural ventilation vis a vis CO2 levels and that winter/summer heating and cooling	Technical installations • Notes some potential performance issues with natural ventilation vis a vis CO2 levels and that winter/summer heating and cooling. • Notes comment from IPT that, with TABS, there is no local control; also, further mechanical vent/cooling could be incorporated in future.	Technical installations • Notes some potential performance issues with natural ventilation vis a vis CO2 levels and that winter/summer heating and cooling. • Notes that IPT has provided full explanation of natural ventilation strategy, and this will depend on correct use of the designed systems

* Jan 2016 report used as part of Policy Inception process

Note: Full details of TIRA reports on the Advance II Project are available from the InnovateUK Research Consortium on request.

APPENDIX 10: Supplier Procurement Strategy for Advance II

DC-Advance2 Procurement Strategy

There are XXX number of agreed procurement methods available to the Advance2 Alliance Board as follows:

Advance2 Procurement Method A - Tendered Procurement/Option Appraisal

This is the preferred method of procurement for services/items exceeding £xxx gross cost to the project. The tendering/option appraisal process shall comply with the following requirements:

1. A minimum of three competitive tenders/options should be obtained - if this cannot be achieved then Alliance Board approval is to be gained prior to commencement of the procurement.

2. Terms of appointment and payment are to be agreed, in principle, by the Alliance Board prior to tendering

3. Tenders are to be obtained against a common and appropriate written scope

4. Where possible the tender returns should be benchmarked against appropriate existing data (e.g. SFA model, Advance1) for Cost, Quality and Programme.

5. Each tender/option appraisal shall have a lead within the IPI team

6. Post selection responses will be made to all tenderers

7. Tender returns are to be accompanied by full Ts&Cs which must be accepted by the Alliance Board and the appointing party prior to appointment/order

8. The appointing party is to be agreed by the Alliance Board

Advance2 Procurement Method B – Negotiated Procurement

This method of procurement for services/items may be used for services/items with a gross cost of less than £xxx and otherwise at the discretion of the Alliance Board. Approval form Dudley College must be obtained prior to adopting this method. The Negotiated process shall comply with the following requirements:

1. Justification for adopting this procurement method shall be made and agreed by the Alliance Board

2. Terms of appointment and payment are to be agreed, in principle, by the Alliance Board prior to negotiation

3. The selection of the supplier is to be supported by appropriate reasoning

4. Negotiations are to be conducted against an appropriate written scope

5. Negotiate terms are to be benchmarked against appropriate existing data (e.g. SFA model, Advance1) for Cost, Quality and Programme.

6. Each Negotiated procurement shall have a lead within the IPI team

7. Negotiation outputs shall include full Ts&Cs which must be accepted by the Alliance Board and the appointing party prior to appointment/order

8. The appointing party is to be agreed by the Alliance Board

APPENDIX 11: BIM on Advance II - Information Production Delivery Cycle