Government
Project Delivery

Corporate report

Data Analytics and AI in Government Project Delivery

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Contents

1. Executive summary
2. About this report
3. What do we mean by project data analytics and AI?
4. What's the wider context?
5. What's the opportunity?
6. What's the risk?
7. Creating the conditions for success
8. What are the next steps?

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1. Executive summary

Innovation in data analytics and AI could be transformative for project delivery.

The volume of project data created through and about public investment is our great strength and presents enormous potential.

- We will work together to harness this potential to deliver better project outcomes.
- We will give project delivery professionals the skills to make best use of data.
- We will remove barriers to sharing data.
- We will experiment together to put data at the heart of our delivery.
- We will think big, start small and scale fast, across our diverse projects.

Together, we aim to put the UK at the front of this emerging discipline.

The accelerating rate of innovation in data analytics and Artificial Intelligence (AI) has the potential to significantly impact project delivery and the project delivery profession. It brings transformative opportunities but also some fundamental challenges. We need to grasp these head on.

The UK is already a leading project delivery nation, but to be at the forefront of shaping how project data analytics and AI are used in the public interest we, the project delivery community, will need to work together. This is why the Infrastructure and Projects Authority (IPA), the Central Digital & Data Office (CDDO), the Association for Project Management (APM) and the Major Projects Association (MPA) have come together to set out a framework for the way we will develop the use of project data analytics and AI to help deliver government projects.

There are an array of uses for project data analytics and AI across the diverse range of projects across government. Combined with the uncertainty surrounding the outcome of rapid technological change, this means that a top down, one-size fits all approach to exploiting data is neither possible, nor desirable. Instead, government and its partners will collaborate to create the right conditions for innovation to thrive and ensure

that success is shared at scale across the projects ecosystem. Together we will take action to:

- Empower and enable the project delivery community to experiment to find solutions for the specific challenges they face in their projects and programmes.
- Leverage the benefits of this experimentation to boost performance across the board.

The first tranche of actions are grouped around five themes:

- **Data skills and capability at scale**. We will update the Government Project Delivery Capability Framework, and the associated government accreditation scheme, to be clear on the skills and roles needed for the future. Working with APM, we will set out interventions to grow and deploy these skills.
- **Better data and availability**. We will work together to develop a common set of standards and taxonomy for project data, building a foundation of FAIR[footnote 1] data. Through this, we'll also set expectations on rights of ownership and access to data.
- **Evidence-based decision making**. We will strategically and systematically build the infrastructure across government project data and tools to enable greater insight, benchmarks and the ability to predict performance.
- **Experimenting together**. We will work across government to define and oversee a series of pilots to innovate and experiment. The best bets will be amplified and scaled at pace.
- **Data partnerships**. We will continue to work with professional bodies, academia and industry, focusing on our shared objectives and putting the UK at the forefront of this new project delivery discipline.

Delivery against these commitments will be a collective effort led by the IPA, as the centre of expertise for project delivery in government, working with the Projects Council[footnote 2] and Heads of Profession in departments, CDDO, the professional bodies, academia and industry.

2. About this report

This is a joint report from the IPA, the CDDO, the APM and the MPA. The No.10 Data Science team has also input.

The content draws on a range of sources, including the discussions held at the IPA's project data analytics and AI summit in Belfast in June 2023. In

attendance at this summit were the authoring organisations, together with the project delivery Heads of Profession from across central government departments.

The intended audience of this report is primarily government project leaders. However, given the common issues faced and the interconnected nature of the profession, it is likely to be of interest to all project leaders in the UK.

3. What do we mean by project data analytics and AI?

Working together on this endeavour means we need a common language.

For the purpose of this paper, we are defining project data as any data used for selecting a project and for defining, monitoring and tracking its performance. This could include project registers, schedules, plans, budgets and forecasts, meeting minutes, reports, assurance findings etc. This definition will be refined to create a more detailed definition of project data, as outlined further in section 7.2.

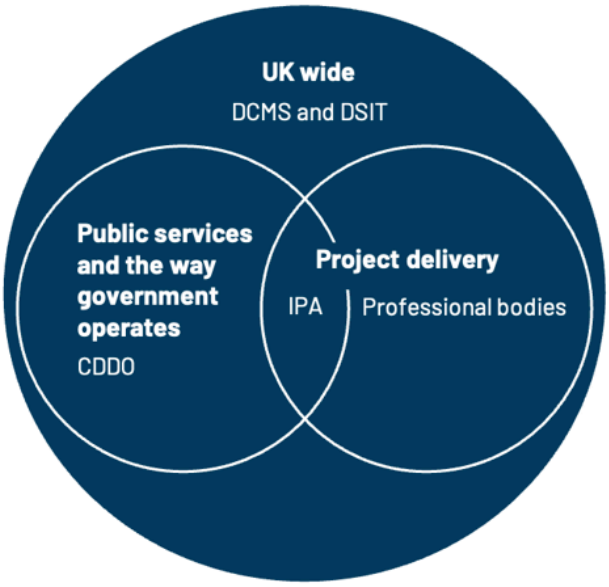
Aligning with the APM's 'Getting Started in Project Data'[footnote 3], we are defining project data analytics as using project data to:

- Automate routine project tasks
- Predict future project performance
- Help make better project decisions

AI as a term can mean a lot of things. We are adopting the 'National AI Strategy' definition: 'Machines that perform tasks normally requiring human intelligence, especially when the machines learn from data how to do those tasks.'

4. What's the wider context?

Exploiting advances in data science and AI is already a priority for the UK government and our partners. This report does not stand alone and purposely draws upon and amplifies other interconnected work, including:



4.1 Government strategy

- The **National Data Strategy**[footnote 4] and the **National AI Strategy**[footnote 5] set out how the UK intends to position itself at the forefront of the data and AI revolution to increase productivity, boost trade, create jobs and revolutionise the public sector. The National Data Strategy identifies four pillars on which realisation of these potential benefits will depend: 'data foundations'[footnote 6], 'data skills', 'data availability' and 'responsible use of data'. These pillars also underpin the actions described in section 7 of this report. The strategy identifies transforming government's use of data to drive efficiency and improve public services as a priority course of action. This can only be achieved through a whole-government approach to which government project delivery will align.
- **Transforming for a digital future: government 2022-25 roadmap for digital & data**[footnote 7] produced by CDDO sets out the strategy for the digital transformation of government operation and service delivery. It outlines concrete and measurable commitments to deliver digital skills at scale and better data to power decision making from which government project delivery will also benefit.
- A **Generative AI Framework for HMG**[footnote 8] has also been produced by CDDO, which provides guidance on using generative AI safely and securely. It sets out ten core principles for generative AI use in government and public sector organisations, and provides practical

considerations for anyone planning or developing a generative AI solution.

- **i.AI[footnote 9] - Incubator for AI** has been established by the Deputy Prime Minister to drive forward the AI capabilities in central government. A central team of technical experts will be empowered to:
  - Improve public services through targeted applications of AI
  - Upgrade AI capability by building data sharing and AI infrastructure for use across government
  - Upskill civil servants to help them apply AI in their own areas of policy or operational delivery

- The **Government Project Delivery Function Strategy**[footnote 10] sets out strategic objectives for where we want to be as a function by 2025. One of these objectives is data-driven performance: using data, analysis and experience to drive continuing improvement in government project delivery planning, performance and outcomes. This report provides more detail on how we will deliver on this objective (see section 5).
- The **Government Functional Standard for Project Delivery**[footnote 11] sets the expectations for the direction and management of portfolios, programmes and projects. Mandated for government departments and arm's length bodies, the standard provides the current expectations for how information and data should be managed as well as for the wider project delivery practices which we will want to enhance through better use of technology.
- **Transforming Infrastructure Performance (TIP) Roadmap to 2030**[footnote 12] is an IPA led change programme to drive a step change in infrastructure performance, enhancing productivity, reducing costs, and improving the sustainability of all projects across government. Data and insight is one of the key TIP themes and progress has been made in this area through the development of a cross-government benchmarking data service (see section 7.3), standardised project metrics and a digital maturity assessment.

4.2 Our partners

Alongside government, project professionals in industry, academia and public services have come together to develop UK practice through the Project Data Analytics Task Force (facilitated by APM and MPA). Key outputs from the taskforce include:

- **Transforming Project Performance with Data**[footnote 13] sets out a vision for securing a tenfold improvement in project delivery performance.

- **Getting Started in Project Data**[footnote 14] is a guide to support organisations along their journey into project data analytics. It proposes that every project delivery organisation should have a data strategy.
- The **Project Data Analytics Task Force Manifesto**[footnote 15] highlights six key principles for unlocking the potential of data driven project delivery.
- **Developing Project Data Analytics Skills**[footnote 16] provides guidance for the profession on how to embed new skills and capabilities, including the role of digital and data professionals in project management. It unpacks what it means to be a ‘data-literate project professional’.

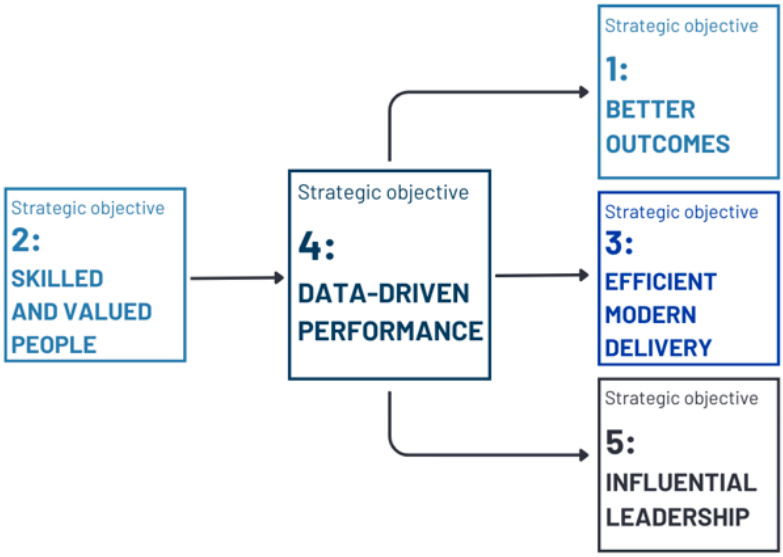
The APM sponsored Project Data Advisory Group is pursuing a range of activities and interventions including the incorporation of AI and Data Analytics into the APM formal body of knowledge, in a refresh due to be delivered in 2025.

This collective body of work - from government and our partners - signals a shared focus on the unrivalled potential offered by project data analytics and AI.

5. What’s the opportunity?

Data-driven performance is one of the core objectives of the Government Project Delivery Function Strategy.

The use of data analytics and AI is also an important enabler of three of the strategy’s other core objectives: better outcomes, efficient modern delivery and influential leadership.



Better outcomes. Data analytics and AI have the potential to be game-changing enablers of better outcomes for UK citizens. Systematic aggregation, sharing and learning of lessons across the portfolio could improve outcome-focused decision making and approvals. It will help us set more realistic goals and temper optimism bias. It also presents the opportunity for better option selection, and indeed better project selection, allowing us to focus on those interventions which give us the biggest return on our investment.

Efficient Modern Delivery. 'The Government Efficiency Framework'[footnote 17] defines efficiency as 'being able to spend less to achieve the same – or greater – outputs, or to achieve higher outputs while spending the same amount'. Greater automation, stronger controls, evidence-based decision making, reducing duplication and working in a more streamlined way will undoubtedly mean we're able to do 'more with less'.

Influential Leadership. The UK has a track record of leading development and sharing of project management practice at the global level, both through government methodologies (such as HM Treasury's Green Book and IPA's Project Routemap) and industry, brought together by the professional bodies. The UK has the opportunity to lead the conversation and boost the use of this emergent technology for the benefit of project outcomes and project professionals.

The final core objective, **skilled and valued people**, is essential to enable data-driven performance. To make the most of data and technology, we must have the data and business change skills to draw on. These data skills range from basic data literacy to programming, data visualisation, analysis

and database management. Section 7.1 sets out how we'll begin to build this capability.

Examples of project data analytics and AI opportunities

Predictive analytics
AI can be used to forecast project outcomes. Using machine learning[footnote 18] models (a subset of AI techniques) it is possible to make predictions about how a project could develop in the future. This relies on high quality, representative historical project performance data.

Traditional natural language processing approaches
Natural language processing can help identify and classify relevant text from longer extracts. This technique could be used to automatically extract and categorise recommendations - for example, from an assurance report. This benefits both summarisation of the report in question, but also provides data for further analysis (such as the predictive analysis described above).

Large language models[footnote 19]
Although there are potential issues around feeding official or commercially sensitive information into publicly available large language models, they can still be used for other purposes. For example, generating generic risk registers or other project documentation which can form a starting point for more detailed work by the project team. With the right funding, infrastructure and expertise, open-source models can be hosted securely in closed loop environments, enabling the model to be further trained or fine-tuned specifically using project data. This would allow text, image and code summarisation and content generation to be tailored to the government project delivery context.

6. What's the risk?

Alongside these opportunities, AI also poses risks. Following the AI Safety Summit[footnote 20], for the first time there is a shared consensus on these risks, and on the need for collaborative mitigating action. We know not all AI risks arise from the deliberate action of bad actors. Some emerge as an unintended consequence or from a lack of appropriate controls to ensure responsible AI use[footnote 21].

Perhaps the most immediate risk of the application of AI in project delivery is that insight from data is not fully understood, based on poor quality data

or incorrectly applied models. For example:

- Available data may be insufficient in either quality, quantity or both to support the application of AI. Consequently, outputs may not be robust enough to support decisions, leading project delivery professionals to make erroneous decisions on the basis of this incomplete or poor data.
- AI models can deliver systematically biased results as a result of incorrect input assumptions. Biases can be introduced at any stage in the AI lifecycle, from collecting data that are not diverse or representative to decisions made in the model-building process. Without careful testing and efforts to minimise bias, human incurred viewpoints can be perpetuated resulting in project delivery professionals making poor decisions.
- AI applications are often seen as a 'black box'. It is difficult for many people to understand how they work in general terms, let alone the calculations and assumptions the AI is making. The risk here is twofold: outputs are either taken at face value or, conversely, they are treated with suspicion or discarded out of hand.

Our approach must also remain alert to the longer-term risks posed by the following key characteristics[footnote 22] of AI:

- The '**adaptiveness**' of the technology: AI systems are 'trained' to operate by inferring patterns and connections in data which are not easily discernible to humans. Through such training, AI systems often develop the ability to perform new forms of inference not directly envisioned by their human programmers.
- The '**autonomy**' of the technology: Some AI systems can make decisions without the express intent or ongoing control of a human, so it is unclear who is accountable for their autonomous actions.

In the short term, given our anticipated use cases and current level of maturity, the 'adaptiveness' and 'autonomy' of AI pose fewer immediate risks for project delivery but will be closely monitored as the technology develops and new use cases emerge.

As well as technical risks, we must also be mindful of the business risks associated with investment in new technology, particularly given current levels of maturity and capability.

In section 7.4 we set out our approach to defining our risk appetite, and governing decisions on investment of effort in innovation with an understanding of the risk implications.

7. Creating the conditions for success

There are an array of uses for project data analytics and AI across the diverse range of projects in the government portfolio. Combined with the uncertainty surrounding the outcome of rapid technological change, this means that a top down, one-size fits all approach to exploiting data is neither possible, nor desirable. Instead, government and its partners will collaborate to create the right conditions for innovation to thrive and ensure that success is shared at scale across the projects ecosystem.

Given the opportunities and risks presented by the use of project data and AI, doing nothing is not an option. However, trying to anticipate how the technology will develop and iterate would be counterproductive. Our initial approach, as we understand more about the potential of how project data can help us deliver better outcomes, should be about ‘no regrets’ actions. These will be a combination of:

- Foundational building blocks on which future actions can be built (see 7.1 and 7.2)
- Experimentation and innovation at local levels to generate actionable insight and ways of working (see 7.3 and 7.4)
- Working together, across government and with industry, to highlight innovation, and scale best bets for wider benefits (see 7.5)

Under this decentralised approach there is an important empowering and enabling role for the IPA, Projects Council and CDDO, working with the professional bodies.

Departments, delivery bodies and individual projects may need support to boost their capacity and capability, where it is low. We will remove barriers to sharing data where appropriate, by developing common standards, infrastructure and processes, so that the potential of new technology can be realised. As well as supporting innovation, the IPA will act in a convening role across the project delivery community to ensure we can all learn quickly and scale up to drive improved performance across the board. We will also collaborate broadly, leveraging government’s already strong relationships with industry and academia.

Our efforts will be focused around five priority themes:

1. Data skills and capability at scale
2. Better data and availability
3. Evidence-based decision making
4. Experimenting together
5. Data partnerships

7.1 Data skills and capability at scale

The opportunities outlined in section 5 cannot be realised without rapidly and strategically growing data capability. Significant investment in upskilling is already underway across the profession and government. We are also working to consider how a data-led approach might impact project delivery roles and delivery models, as well as the capability required to manage this change.

Increasing data skills
Harnessing data skills at scale requires collective action. To incentivise this shared behaviour across government, the annual 'One Big Thing'[footnote 23] initiative for 2023 focused on 'data for all'.

Outside of government, project data analytics is increasingly being incorporated into standards, including the APM Body of Knowledge and APM Competence Framework, reflected in its qualifications and chartered standard. Reskilling for a data and digital-enabled world is also one of the six pledges of the 'Manifesto for Data-Driven Projects'[footnote 24](see section 7.5).

As well as data skills, adapting to and embedding project data analytics and AI into our ways of working will require a concerted and significant change management effort.

Clear roles and career paths
Any significant change to our skills profile will have implications for roles and career paths. The 'Digital, Data and Technology (DDaT) Profession Capability Framework'[footnote 25] sets out cross-government definitions of key data-related roles, many of which will be deployed within projects.

However, there remains considerable uncertainty about the impact of data analytics and AI on existing project delivery roles. Some may be significantly impacted, with role redefinitions required to include data analytics responsibilities and competencies, while entirely new roles are also likely to emerge. APM has published a framework for 'Developing Project Data Analytics Skills'[footnote 26] which uses personas to demonstrate how different roles within a project might have different skill levels, interests and motivations for using data.

The IPA, supported by Projects Council, will reflect on the DDaT and APM frameworks, consider what this means for the capabilities required by government project delivery professionals and update the 'Project Delivery Capability Framework'[footnote 27], the learning offer and the associated accreditation scheme.

Delivery models
There will also be implications for project delivery models. Projects will need to consider the extent to which they draw upon third-party data specialists versus growing their own talent, either held centrally by the portfolio or embedded within the project team. As a minimum, having enough data skills in-house will be critical to being a ‘smart’ procurer of services and tools from the market. Government will work with its partners and professional bodies to articulate the range of possible alternatives.

7.2 Better data and availability

The effectiveness of any analysis and insight is wholly dependent on the quality of the underlying project data. As set out in the ‘National Data Strategy’, we know the true value of data can only be fully realised when we have:

- **Data foundations** - fit for purpose, recorded in standardised formats on modern, future-proof systems and held in a condition that means it is findable, accessible, interoperable and reusable (FAIR).
- **Data availability** - appropriately accessible, mobile and re-usable, through improved coordination and appropriate protections for the flow of data between organisations.
- **Responsible data** - used in a lawful, secure, fair, ethical, sustainable and accountable way, while also supporting innovation and research.

These requirements are inherent to the use of data in all settings. In addition, there are specific challenges which relate to government projects:

- The diversity of projects, in terms of type, sector, scale and complexity.
- Differing levels of maturity across departments and suppliers, and varying degrees of private and third sector collaboration.
- The sensitivity of project data - security, political and commercial - which understandably creates barriers to sharing both internally, between government projects, and externally, between government and industry.
- Challenges of knowing where data is stored and who has reasonable rights to access it.

We recognise that the vast volume of data generated across government projects is our great strength. With over 600 public bodies, as well as local government and suppliers collecting data on their projects, its collation and analysis presents enormous potential.

A number of government frameworks have already been developed to enable a practical and co-ordinated approach.[footnote 28] Several private sector organisations are also investing effort to address the challenge of data quality.

Building on these frameworks and the work already underway, the Government Project Delivery Function will lead the establishment of standards for project data to build the foundations for FAIR data that could, in time, be pooled across the data ecosystem. We will also consider the commercial sensitivities and our levers to set expectations on rights of ownership and access to data, with a view to removing or mitigating some of the current barriers to sharing.

7.3 Evidence-based decision making

If we have better, more available data, we can then begin to use it to our advantage. At the moment, our decision-making too often lacks a robust evidence base or is influenced by subjective human factors such as bias.

The IPA is in the process of moving its government major project data collection to a purpose-built Cabinet Office platform - the **Government Reporting Integration Platform** (GRIP). This will allow us to better tailor data collection to our requirements, and show how projects align to government policy priorities. The expansion of the data environment will also enable more sophisticated analysis within and across projects and portfolios, including the application of machine learning tools.

Pooling and sharing project data can help provide norms and predictions of performance. The **IPA Benchmarking Data Service** is a new cloud-based data platform developed to share project data, enabling departments to learn from historical data to better inform decisions on current and future projects. It will provide flexibility to benchmark at various levels - from individual projects, to different types of project, to the portfolio as a whole. It will grow and adapt over time, striking a balance between government priorities, materiality and user demand. Its value will depend on a coordinated approach, both within government, with private sector partners and academia.

These two data repositories, alongside the significant data sets from assurance reviews, provide the potential for a vast project data set within government which can and should be leveraged to provide improved, more timely insight on project performance, driving productivity and quicker decision making.

The **Data Science team in No.10 (10DS)** has been developing and testing innovative methods and enabling digital infrastructure to ensure that data,

evidence, and analytics sit at the heart of central approaches. The IPA will continue to work with 10DS to apply innovation and new technologies, and to upskill people to fuel reliable data-led delivery.

Going forward, as clear use cases emerge (see section 7.4), we will want to develop or procure other tools. Doing this in a joined-up way and leveraging our collective bargaining power will be critical in enabling government to procure tools and services more efficiently.

7.4 Experimenting together

The rapid pace of change and varied nature of potential use cases means that bottom-up experimentation will be the key to success. Government departments, delivery bodies and their private sector partners will need to run trials and iterate solutions for the specific challenges they face in their projects and programmes.

The IPA and Projects Council, as the centre of expertise for project delivery in government, is in a unique position to capture and share the range of experiments underway across government, to learn, test and scale quickly. The MPA and APM are similarly well-placed to fulfil this role for major projects and across the whole UK project management profession respectively.

The government profession network has a key role to play in sponsoring structured pathfinder pilots in which to invest our collective effort and deciding which experiments should be scaled up for further benefit.

The IPA and Projects Council will convene experiments and conversations to:

- Define use cases across the range of our programmes
- Steer experimentation with different data sets and data skills to create insight
- Inform investment in tools and skills to pool, collate and analyse data sets, using our collective buying power
- Amplify and scale the most promising opportunities

Initially, given the risks of not understanding the tools and flaws in the data we are using, the focus will be on ‘no regrets’ low risk innovation to drive efficiency and productivity. As our understanding and confidence improves, we will concentrate on use cases that contribute to wider government priorities.

Wider adoption of the most successful experiments will likely require new business processes and ways of working. We will leverage the reach of the Projects Council and Heads of Profession network and Communities of Practice across the Government Project Delivery Function to champion and lead these changes.

7.5 Data partnerships

Leaders in government project delivery have an important role alongside this in amplifying and scaling innovation across the government portfolio (see section 7.4). To truly unlock the full potential benefit of project data-analytics and AI for public good, we will collaborate more broadly.

Government already has strong relationships with professional bodies, industry and academia, focusing on our shared objectives and putting the UK at the forefront of this new project delivery discipline.

One such important collaboration is the Project Data Analytics Taskforce, which produced a ‘Manifesto for Data-Driven Projects’. Government is committed to the six pledges underpinning the manifesto’s goal of progressing the adoption of data analytics in project delivery. Continuing to work with industry, we will embed these principles into our ways of working for collective benefit.

The manifesto pledges:

1. We use data analytics to **bust project management myths and beliefs**.
2. All projects are **data designed and enabled**.
3. We pool our data to **maximise insights**.
4. We **collaborate on opensource data analytics solutions** tackling priority challenges.
5. We **re-skill** for a digital and data-enabled world.
6. Data analytics is **codified** in all aspects of project delivery best practice and culture.

Other examples of data partnerships include:

Collaborating with professional bodies on thought leadership. Working with professional bodies such as APM, MPA, PMI, RICS, ICE and others will provide the thought leadership to stimulate and celebrate a data-driven

transformation. A recent example is the APM ‘Developing Project Data Analytics Skills’ framework.

Sponsoring research by academia. Working with academia, we will explore the benefits and expand on our collective knowledge of the potential uses and risks of project data.

Working with industry to champion UK excellence in data driven project delivery. Working with industry, we will create an environment that incentivises sharing of data, tools and skills between government and private sector partners.

8. What are the next steps?

This paper sets our direction of travel to harness the benefits of project data and AI for government projects and wider UK project focused organisations. Delivery against these ambitions will be a collective effort led by the IPA and the Projects Council, working closely with Heads of Profession across government, CDDO, 10DS and the professional bodies.

We will iterate and be agile in our approach as our understanding of the opportunities and risks grow. Progress across all areas will not be linear, but will be informed by access to information, resources and tools.

Data skills and capability at scale. We will update the Government Project Delivery Capability Framework, and the associated government accreditation scheme, to be clear on the skills and roles needed for the future. Working with APM, we will set out interventions to grow and deploy these skills.

Better data and availability. We will work together to develop a common set of standards and taxonomy for project data, building a foundation of FAIR data. Through this, we’ll also set expectations on rights of ownership and access to data.

Evidence-based decision making. We will strategically and systematically build the infrastructure across government project data and tools to enable greater insight, benchmarks and the ability to predict performance.

Experimenting together. We will work across government to define and oversee a series of pilots to innovate and experiment. The best bets will be amplified and scaled at pace.

Data partnerships. We will continue to work with professional bodies, academia and industry, focusing on our shared objectives and putting the UK at the forefront of this new project delivery discipline.

1. FAIR data are data which meet principles of findability, accessibility, interoperability, and reusability (FAIR).
2. The Projects Council comprises Chief Project Delivery Officers of central government delivery departments and is chaired by the IPA CEO as Head of Function. It is responsible for overseeing and managing the project delivery function within government.
3. APM, Getting Started in Project Data (PDF, 1.57MB) (https://apmv2-live-cms.azurewebsites.net/media/2fehl0pm/getting-started-in-project-data.pdf) (2022)
4. GOV.UK, National Data Strategy (https://www.gov.uk/guidance/national-data-strategy) (2019)
5. GOV.UK, National AI Strategy (https://www.gov.uk/government/publications/national-ai-strategy/national-ai-strategy-html-version) (2022)
6. The National Data Strategy uses the term ‘data foundations’ to mean data that is fit for purpose, recorded in standardised formats on modern, future-proof systems and held in a condition that means it is findable, accessible, interoperable and reusable.
7. GOV.UK, Transforming for a digital future: government 2022-25 roadmap for digital & data (https://www.gov.uk/government/publications/roadmap-for-digital-and-data-2022-to-2025/transforming-for-a-digital-future-2022-to-2025-roadmap-for-digital-and-data) (2023)
8. GOV.UK, Generative AI Framework for HMG (https://www.gov.uk/government/publications/generative-ai-framework-for-hmg/generative-ai-framework-for-hmg-html) (2023)
9. GOV.UK, i.AI (https://ai.gov.uk/) (2023)
10. GOV.UK, Government Project Delivery Function Strategy 2025 (https://www.gov.uk/government/publications/government-project-delivery-function-strategy-2025/government-project-delivery-function-strategy-2025-html) (2023)
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13. MPA, Transforming project performance with data (PDF, 1.37MB) (https://1ba20846-0656-45c0-ae36-728cc216e221.usrfiles.com/ugd/1ba208_06d3f82cd7ee4e658e1a303be97097a1.pdf) (2021)

14. APM, Getting Started in Project Data (PDF, 1.57MB) (https://apmv2-live-cms.azurewebsites.net/media/2fehl0pm/getting-started-in-project-data.pdf) (2022)
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16. APM, Developing Project Data Analytics Skills (PDF, 1.09MB) (https://www.apm.org.uk/v2/media/g2chezrx/developing-project-data-analytics-skills.pdf) (2023)
17. GOV.UK, The Government Efficiency Framework (https://www.gov.uk/government/publications/the-government-efficiency-framework/the-government-efficiency-framework) (2023)
18. Machine learning is intelligent processing that involves computer algorithms that 'learn from doing'. Machine learning trains systems to progressively identify the characteristics of items and patterns of data to provide insights and aid decision-making.
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