‘Start with the end in mind’

Accelerate the digitisation of your capital projects and asset operations

Situation

There is growing pressure on UK infrastructure

UK infrastructure is currently facing a unique challenge. The ageing infrastructure is under pressure to increase performance and delivery of essential services for a growing population. This is whilst managing regulatory and political pressures, customer expectations and driving the sustainability agenda to meet the net zero emissions target.

The population across the whole of the UK is forecast to reach over 73 million by 2050 driving urbanisation and increasing pressure on utilities. Energy demand is expected to increase, with a forecasted 50% increase in electricity production required by 2040. Water networks are expected to increase capacity to 3.6 billion litres per day to meet demand. Higher transportation performance is needed to increase regional productivity, customer experience and quality of life.

There is strong recognition that the nation's ageing infrastructure needs significant investment to support the future needs of the UK as:

- two-thirds of nuclear electricity generation capacity will be retired by 2030
- the cost of strategic road congestion is expected to hit £8.6bn by 2040
- UK rail network running costs are 40% higher compared to benchmarks across Europe

Improving capital project execution is essential to achieving an ambitious future

The challenges provide the opportunity to do more with our existing infrastructure whilst creating new assets to provide sustainable services for the future.

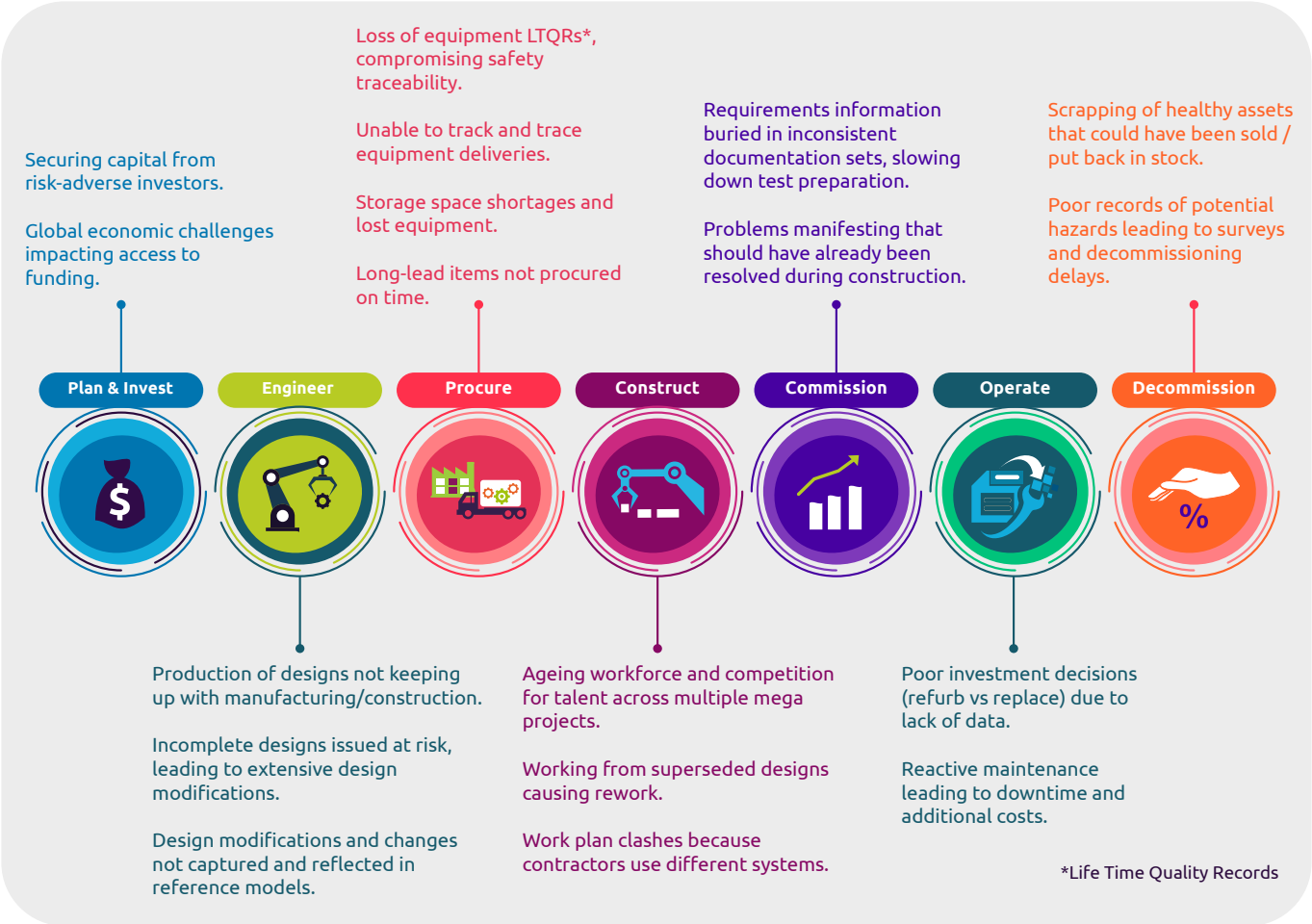
Improving capital project execution and management of new and existing assets is essential to help achieve this ambitious future.

To meet the challenge, planned investment in energy and overall infrastructure has never been higher. The government's regional and national investment pipeline totals £413Bn, over 75% of which is targeted at critical energy, transport and utilities projects. To achieve this ambitious future, the return on investment must be maximised.

The current challenge

Delivering modern capital projects can be extremely complex

Modern capital projects often cost billions of pounds and involve schedules that can stretch over a decade. The engineering and technology involved tends to be highly complex and supply chains are multi-tiered and global. Capital projects are often delivered in very different geo-political, economic and societal conditions to when they were originally conceived. History has demonstrated how challenging it is to deliver these projects to their original budget. Large infrastructure projects typically experience budget overruns of 35% with an average delay of 2 years. Below are several common challenges that capital projects experience, which can lead to delays and cost overruns.



Why do I need to act now

Given the current societal and economic needs, the business case for new infrastructure has never been more compelling. It can be challenging to secure finance for these 'mega projects' as investors seek increased confidence that projects will deliver on time. Furthermore, there is less access to private funding and in turn increased competition to secure it. These financing challenges mean that budgets tend to be more investable than they are achievable as optimism bias can be prevalent to secure the final investment decision. It is therefore difficult to make cost savings on an original budget that was under estimated. Furthermore, for every day a project overruns, the extra construction costs are compounded by lost revenue opportunity from the asset. A key focus during capital project delivery is to de-risk the critical path to protect the schedule, safely and without compromising quality.

The 5 key principles to success

Given the challenges, how can project leaders get ahead of the curve to make sure their project and portfolio are set up for success and to deliver their commitments to investors? With a move to an increasing digital economy, project leaders are looking at how they can embrace more digitally enabled ways of working. This includes driving increased standardisation and repeatability to project execution in order to reduce total cost of ownership (TCO). We believe the following 5 key principles are the foundations to help project leaders drive their digitisation agenda across their project and asset portfolio.

1.Start with the end in mind

Capital projects are complex and run for many years while project leaders have to deal with the here and now. It's very difficult and costly to play catch up with issues when you get to the point of system testing, completions and handover. It is important that prior to Final Investment Decision (FID), the project team have a clear view of what capabilities they will require to complete downstream activities. Working 'right to left' in the financial planning phase will help the team identify likely challenges and develop the means from which to mitigate these during the project set up phases. The project leadership can have the confidence that they have defined what capabilities the project needs and correctly sized the business to effectively deliver these services.

2.Define the strategy of the project/ asset in the context of the portfolio

Project leaders must balance the need of the portfolio and how it improves with each new project. They need to set out the strategy for how existing assets will be optimised and how all new capital projects and assets will incrementally improve the overall performance of the portfolio. In particular they need to show how each subsequent project has improved from the lessons learnt of the previous builds and demonstrate to investors how new technologies and techniques will help reduce the cost of future projects.

3.Have a clear starting point for your digitisation journey

Integrating processes across functional and organisational interfaces to reduce delivery risks is typically where you see the biggest benefit from digitisation. The nature of these processes mean they are complex and undertaking too many of these processes (particularly in parallel) can often lead to suboptimal results as the project cannot cope with the volume of change. Therefore instead of integrating all of these processes at once, pick a safe base from which to begin digitising processes, then build confidence and momentum from there.

4.Balance the human capital knowledge/advantage you have across the project and portfolio

People provide our strongest reference point through experience and insight allowing us to continually improve on what has been done before. Tools can provide a platform from which to codify the corporate memory and exploit this at scale. However, project leaders need to deploy the organisational constructs and capacity for the business to have the resilience to adapt, reshape and continue as people move on to support and drive other priorities across the portfolio.

5.Be clear how you maintain the digital thread through the lifecycle of the project and across the portfolio

The digital thread should be designed to support traceability through the lifecycle of a project and across a portfolio. Integration of this information will support more effective decision making and reduce the time for resolving conflicts and issues later in the life of the asset. It is important to know what information will be required to support system testing, completions and handover to operations. Physical means and a common understanding are required for capturing, retaining, updating and linking information. Project leaders will need to work back through the the different phases of the project and define what information (and what format) is expected to be received from partner organisations. In addition, the portfolio should know how information from a project will be re-used to support future projects.

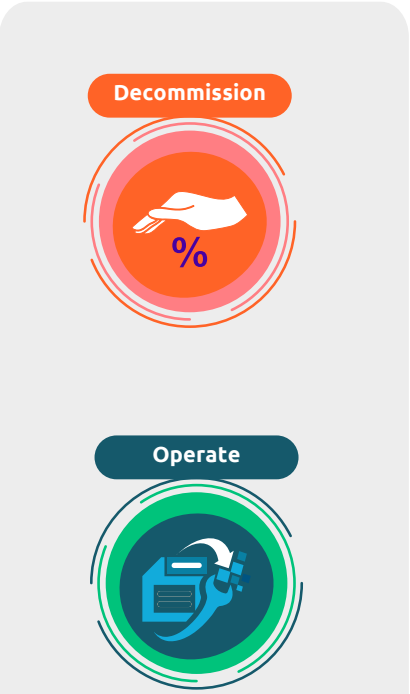
Starting with end in mind, we have mapped out a selection of key questions that project leaders should consider. These are designed to inform their digitisation journey to set up the project and portfolio for success.

Key questions to inform your digitisation journey

We start at the end of the Asset Lifecycle to define the success criteria for the project, asset and overall portfolio. Typical success factors include:

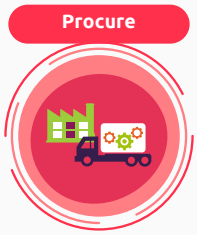
- A safe, operational asset: delivered on time and to budget;
- A base-lined portfolio of assets that can be performance managed to improve availability;
- Operational investments optimised in context of the entire portfolio's TCO;
- An asset that generates information and IP that benefits the entire portfolio; and
- An asset that is designed, operated and funded to support a cost-effective and environmentally sustainable decommissioning process.

Understanding what will drive complexity and risk in the project delivery and asset operations will dramatically improve the chances of realising the strategic ambition and return on investment. The following questions are designed to help project leaders identify some of the future challenges and measure their readiness on how to manage them.

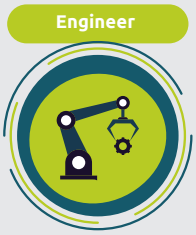


- How do you ensure that systems are handed over for testing on time and in the correct configuration?
- How do you ensure requirements are comprehensive, up to date, sufficiently detailed and easily reconcilable with systems / components?
- How do you ensure requirements are in an accessible, consistent and workable format (e.g. to design tests and validate results)?
- How do you monitor the progress of construction system completion, for planning purposes?

- How do you have confidence that a design is the correct version and is mature enough for consumption?
- How do you maximise the percentage of issues that can be resolved locally?
- How do you maintain visibility of materials, resources and area access availability?
- How do you maintain visibility of what other construction contractors are doing to avoid clashes?



- How do you ensure manufacturers are issued with the latest designs?
- How do you capture, flag and resolve non-conformances across a global supply chain?
- How do you track and trace equipment and materials through the supply chain?
- How do you gain sufficient visibility to expedite equipment to meet construction schedule milestones?
- How do you capture information that is provided with equipment (e.g. LTQRs and maintenance manuals) that are required later for construction, commissioning, operations and decommissioning?



- How do you ensure designs are sufficiently robust before being released to minimise the number of RFIs and modifications that come back?
- How do you efficiently review, approve and accept new designs / design modifications?
- How do you manage the interfaces between design organisations (including turnkey contracts)?
- How do you maintain the reference design over the duration of the build?

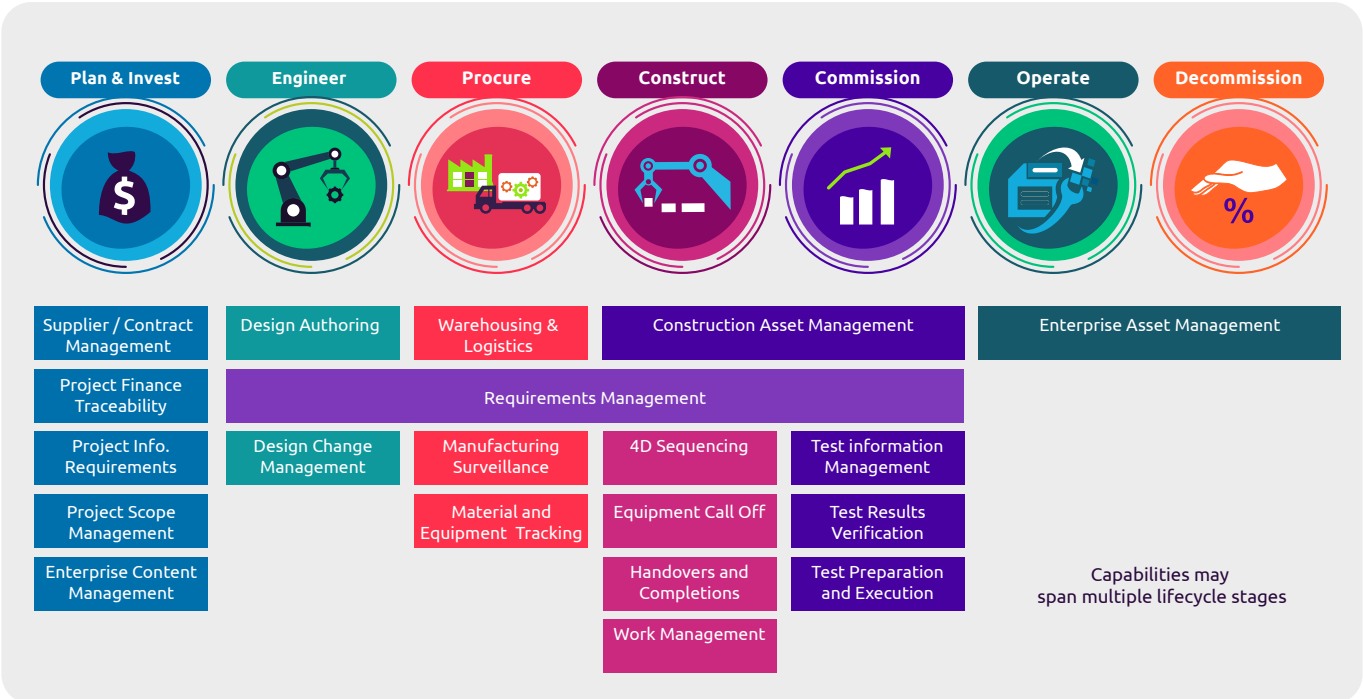
- How do you give your investors enough confidence to say 'yes'?
- How do you ensure the project organisation is 'fit for delivery' (with appropriate governance, capabilities and processes in place) before FID?
- How do you identify and agree what systems and capabilities will be provided by suppliers?
- How do you specify effective information requirements in contracts?

Where to start - digitisation priorities

Every capital project is different and the starting point for project leaders can vary depending on which stage of the asset lifecycle you are in. Starting with the end in mind and developing a strategy for the project and portfolio will help define what capabilities and services are required.

The increased scalability and readiness to adopt emerging technology has driven deeper integration of enterprise management systems (e.g. finance, HR, supply chain, enterprise content management) with engineering, work execution and operational systems. These include Plant/Product Lifecycle Management Systems (PLM), Manufacturing Execution Systems (MES), Geospatial Systems Work and Asset Management (WAM), health usage and monitoring systems, automated Project Controls etc.). Knowing where to deploy these tools to maximise performance is the first step in the digitisation journey.

Based on our experience we have identified over 150 core business capabilities across the project and asset lifecycle. Categories range from governance and business support through to construction execution and asset decommissioning. It is not feasible or necessary to digitise and integrate all of these capabilities. We have identified some of the foundation capabilities below as a starting point to create the digital continuity of your assets from system requirements through to asset replacement and end of life. Increased integration of these capabilities will provide improved visibility and control of the equipment and plant/ asset configuration so when things go wrong you can follow the 'digital thread' and quickly pinpoint the root cause of the issue.



Knowing where to start is the first step

Driving clarity and consensus across the delivery organisation and partners on who is providing what service and information will be critical for creating the digital continuity to improve project and asset performance.

Clearly establishing the blend and boundaries for each capability will help clarify the relative priorities of the constituent components to shape the:

- Organisational design and underpinning culture for successful project execution
- Information and data management strategies that will support through the lifecycle of the asset
- Technology selection to incorporate new and emerging solutions that are scalable and future proof

Ultimately, the success of any digital enablement will be predicated on the project and businesses willingness to embrace and adopt the new ways of working. Getting the end recipients buy in and confidence in the working and relative benefits of doing things differently will be fundamental to achieve the desired outcome.

Why Capgemini

'Starting with the end in mind' Capgemini help Project Leaders bring to life how they will digitise their future capital projects to provide delivery confidence through new and more integrated ways of working. We help shape the case for change to secure investment to deploy emerging technologies and capabilities that can 'protect the critical path' of the capital project and achieve the digital continuity through construction, asset operations and decommissioning across your portfolio of assets.

We bring together key strengths in consulting and technology powered by our global partner ecosystem to drive integrated business solutions for our clients.

Our global expertise in large scale transformation projects, combined with our long tradition of technology innovation with clients and partners can help you gain sustainable competitive advantage through the lifecycle of your capital project and asset.

For more information please contact

Pete King
Vice President
Head of Energy and Utilities
peter.king@capgemini.com

Dinesh Sathianathan
Director
Nuclear, Infrastructure and Digital Engineering
dinesh.sathianathan@capgemini.com

Orlando Valota
Managing Consultant
Nuclear and Infrastructure
orlando.valota@capgemini.com

References

National population projections: 2018-based https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2018based

IEA Website – World Energy Outlook, accessed June 2020 https://www.iea.org/reports/world-energy-outlook-2020

UK 2070 Commission http://uk2070.org.uk/wp-content/uploads/2020/02/UK2070-FINAL-REPORT.pdf

Infrastructure Projects Authority, "National Infrastructure and Construction Pipeline 2018'' https://www.gov.uk/government/publications/national-infrastructure-and-construction-pipeline-2018

The overall system for managing water resources https://publications.parliament.uk/pa/cm5801/cmselect/cmpubacc/378/37806.htm

https://www.world-nuclear.org/information-library/country-profiles/countries-t-z/united-kingdom.aspx

Capgemini World Energy Markets Observatory 2019

FT.com Rail: Frustration grows with Britain's fragmented network, Jan 2018 https://www.ft.com/content/d82848ca-f7ba-11e7-88f7-5465a6ce1a00

About Capgemini

About Capgemini

Capgemini is a global leader in consulting, digital transformation, technology, and engineering services. The Group is at the forefront of innovation to address the entire breadth of clients' opportunities in the evolving world of cloud, digital and platforms. Building on its strong 50-year heritage and deep industry-specific expertise, Capgemini enables organizations to realize their business ambitions through an array of services from strategy to operations. A responsible and multicultural company of 265,000 people in nearly 50 countries, Capgemini's purpose is to unleash human energy through technology for an inclusive and sustainable future. With Altran, the Group reported 2019 combined global revenues of €17 billion.

Visit us at

www.capgemini.com