

GEARING COMPLEX ENGINEERING PROGRAMMES FOR SUCCESS

COMPARING TWO OF THE UK'S MOST COMPLEX
ENGINEERING PROGRAMMES: LONDON BRIDGE STATION
& THE HMS QUEEN ELIZABETH AIRCRAFT CARRIER





When we get things right, it feels great. The joint sense of achievement in completing a project like London Bridge Station is palpable right across the team. Transforming a critical part of London's transport infrastructure to meet twenty-first century needs has involved delivering a complex programme safely and efficiently whilst also keeping the public on the move."

IAN PARKER,
SECTOR DIRECTOR - RAIL, COSTAIN



Launching a brand-new ship for the Royal Navy is always greeted as a historic moment for the country. Seeing the countless photos of HMS Queen Elizabeth cruising into Portsmouth Harbour, with the ship's staff stood to attention on the flight deck, was a moment of absolute pride for anyone involved in the programme. Everyone's hard work had come to fruition."

STEPHAN SMITH,
DIRECTOR OF INFRASTRUCTURE, NEWTON

FOREWORD

Britain's defence and infrastructure projects introduce ambitious changes to our economy and day-to-day lives.



A new aircraft carrier adds capacity and a sense of pride to our Royal Navy whilst a new station improves travel experiences in our transport system. Both are iconic but also complex undertakings which require high levels of investment and planning.

Delivering major defence and infrastructure projects is a real source of pride for those involved. Breaking down complexity and solving problems through the planning, design and implementation stages means getting our best and brightest people to focus on finding safer, quicker, more effective and more sustainable ways of getting things done. There is nothing quite like the feeling of commissioning a brand-new naval flagship or a totally transformed railway station that will serve the nation for many years to come.

This report tells the story of two complex engineering programmes: the redevelopment of London Bridge Station and the build programme for the Queen Elizabeth Class Aircraft Carriers. In preparing it, we brought together expertise from Newton and Costain to discuss the commonalities and contrasts between the two programmes, identifying areas of learning and best practice that could be shared.

Infrastructure often looks to the automotive sector for inspiration when developing new practices. Yet the automotive business is about customising a standard product in massive quantities; the maritime defence sector, like infrastructure, is about standardising a custom product as a one-off solution. Maritime defence and infrastructure projects require a complex process of forward planning, involve multiple stakeholders and contractors, and extend the boundaries of technical capability.

Over a series of discussions and workshops, Costain and Newton identified three core areas of similarity, which this report focuses on.

We found that it was critical for all stakeholders in a project to have a shared focus. It might seem obvious, but unless management proactively sets up



processes to ensure its objectives are agreed by all, large, complex projects are impossible to coordinate efficiently. In this report, we share our best practice strategies for creating and maintaining a shared focus on-site.

Secondly, we need to understand the programme enablers – what is needed to complete the job. We show what management and the workforce should do to coordinate tools and resources on-site effectively.

Finally, both projects showed the importance of smarter working, and in this report, we illustrate how companies can implement more efficient and tech-savvy ways of working.

We are delighted, therefore, to present to you our findings. Over the next few pages, we will introduce the two projects, outline examples of our problem-solving and explore our best practice findings. We will show how, by implementing our conclusions, projects can improve their on-time and on-budget performance.

We hope that the lessons we outline within will offer a platform for industry-wide debate and advancement as we continue to meet the challenges of the twenty-first century.



Ian Parker
Sector Director - Rail, Costain



Stephan Smith
Director of Infrastructure, Newton

COMPARING INDUSTRIES

Looking at two of the UK's most complex build programmes in maritime and infrastructure.



THE LONDON BRIDGE STATION REDEVELOPMENT

London Bridge is the fourth busiest station in the country, bringing around 56 million passengers into the city each year.

From 2013, the station has undergone an ambitious redevelopment programme to make it bigger, more functional and fully accessible. Since January 2018, passengers have benefitted from new platforms for more trains, a vast new concourse the size of Wembley that can accommodate an annual footfall of 90 million passengers and better connections.

Since 2014, Costain has been providing a wide range of design and development services, programme management and complex delivery services, advisory services, and maintenance support to the station redevelopment.

As well as the redevelopment of the station itself, work at London Bridge has included new railway infrastructure to the east and west of the station. The rebuild project was completed in phases to allow the station to remain open throughout delivery. Costain's core achievement was in keeping the station open throughout the redevelopment and maintaining the bulk of its capacity.

On the approaches to the station, the track has been reconfigured to create nine through-platforms and six terminating platforms. This change is significant because it means that Thameslink trains can pass directly through the station and go on to connect with destinations in the North and South of London. This extra capacity also means fewer trains are delayed waiting for a platform to become available, allowing more commuters to get to their destinations on time. Overall, the project will deliver a 50% increase in passenger numbers and routes.

- The operational environment was complex, with 56 million passengers a year using London Bridge.
- Three train operating companies were based at the station and involved in the project.
- The programme involved interfaces with Thameslink and other key partners.
- It took 27 million working hours to complete the project, with over 17,000 different people involved.
- The overall target cost was £1bn.



THE QUEEN ELIZABETH CLASS AIRCRAFT CARRIERS

The Queen Elizabeth Class Aircraft Carriers project involved building two aircraft carriers for the United Kingdom's Royal Navy. The lead ship, HMS Queen Elizabeth, was commissioned on 7 December 2017. The second, HMS Prince of Wales, was launched on 21 December 2017 and is due to be commissioned in 2020.

The carriers are the largest warships the Royal Navy has ever built and the second largest carriers in the world. They stretched UK ship-building capability to its absolute limits, with blocks being made across the country and assembled in the only UK dry dock big enough to piece them together. Even then, there was only 2m clearance when it sailed from the dock.

They were built by the Aircraft Carrier Alliance (ACA), a partnership between BAE Systems, Thales UK, Babcock and the Ministry of Defence.

As with any ambitious project, the carrier build experienced huge pressure on budget and timescales. Newton was brought in as the transformation partner with the ACA, working from 2014 to drive operational performance through the AIM programme.

"The AIM programme has delivered a 54% performance improvement across one of the UK's most complex build programmes and is regarded as one of the most successful improvement programmes run in this industry sector."
Joe Reilly MBE, Director, Aircraft Carrier Alliance

Through three phases of work over a two-year period, the AIM programme successfully reduced the build schedule by six months, mitigated £120m in forecasted costs and delivered a step change in culture and build philosophy. AIM created a sustainable performance legacy for the remainder of Queen Elizabeth Class build project.

- The carrier projects consisted of an alliance made up of three major contractors supported by five main sub-contractors.
- The carriers were built across six yards before their assembly at Rosyth. Over 700 businesses were involved in the programme across the supply chain.
- 51 million working hours were spent in the design and build of the vessels.
- Each carrier is made up of 17 million parts. There are 364km of pipes, 250,000km of electrical cable and 8,000km of fibre optic cable.
- 11,000 people worked at sites around the country including 3,000 at Rosyth, the main shipyard. These sites were supported by a more extensive supply chain network from around the UK.

THE LONDON BRIDGE STATION REDEVELOPMENT TIMELINE



“All 11 key milestones agreed at outset of programme were successfully met.”
JAMES ELFORD, COSTAIN



Working on a programme involving 3000 people, 14 million working-hours and over 60,000 tonnes of material, is very complex.

This plan can then act as the foundation from which to manage these large and complex programmes.”

STEPHAN SMITH,
DIRECTOR OF INFRASTRUCTURE, NEWTON

“Naval shipbuilding is also still a very labour-intensive industry. Unlike high volume industries like automotive or aerospace, it is difficult to automate the build. The closest you can get to bringing the control that automation gives is to build a live and highly visible plan that everyone believes in and is engaged with.



Our job has been a complicated one. Our role has been to manage this complexity, to simplify the delivery into a realistic programme of activities that can achieve the objectives of the project whilst keeping the station open to passengers.

as large as the aircraft carrier. What’s surprised us is that the projects have more in common than you might expect.”

IAN PARKER,
SECTOR DIRECTOR - RAIL, COSTAIN

“As we are nearing completion of our work at London Bridge, it’s been fascinating to compare and contrast what we’ve done here with what’s been delivered on a programme

London Bridge Station

SUCCESS FACTORS

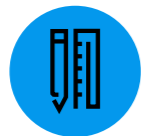
In comparing the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carrier build, we've identified three core factors that are vital to the success of any programme.



Shared focus – the workforce should have a shared vision and focus which enables teams to work together more effectively.



Programme enablers – mechanisms that need to be in place to understand what the workforce needs to be able to complete the programme - and stay motivated.



Smarter working – prototyping and innovating techniques developed for the specific live build when existing techniques would not deliver.





SHARED FOCUS

It is essential that everyone is incentivised towards a set of shared objectives. Moreover, we have to work together, openly and honestly, to manage changes that will inevitably come in a programme.

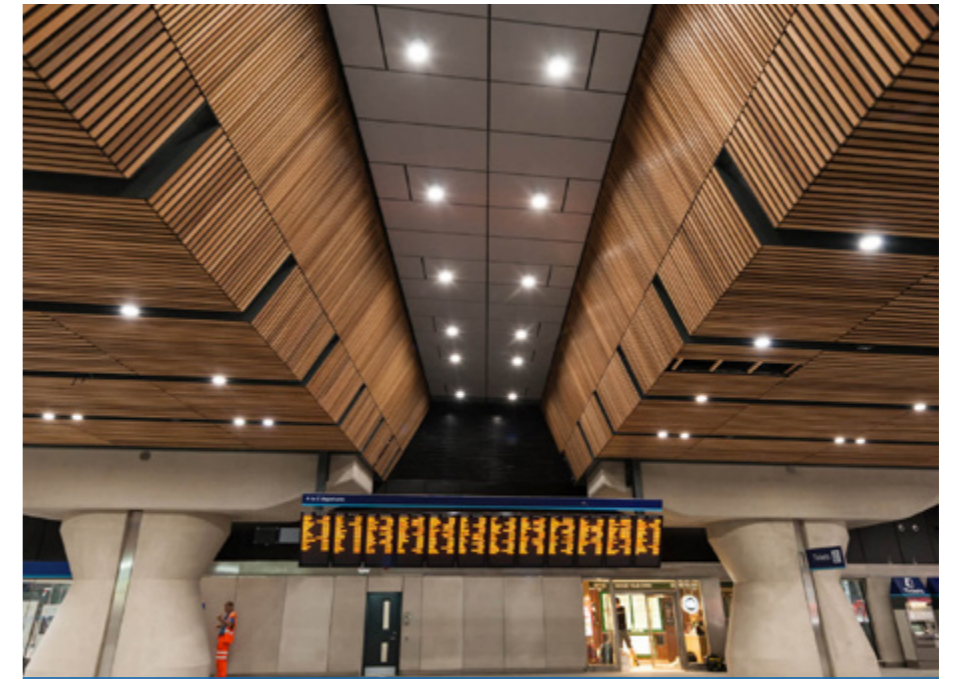


THE LONDON BRIDGE STATION REDEVELOPMENT

The programme objectives were identified in the contracting process. All parties were incentivised to meet the shared 35 Integrated Milestones and worked to assist one another in achieving them rather than pursuing their own goals.

For example, Costain successfully made a trade-off with their partner contractor for signalling for the balustrade camber ballast work. How? There was an upcoming integrated milestone that both Costain and the partner were motivated to hit. While Costain's work on the balustrade camber ballast was essential for the milestone, the signalling work was not. Because of the milestone, they both reached an agreement to hand the balustrade to Costain. The milestones created a culture of mutual benefit which assisted the development of a shared vision and focus, and, ultimately, on-time delivery.

Setting up the Milestones was never going to be enough. They needed to be thoroughly ingrained in the practices of the partner companies and workforce consisting of over 100 contractor companies. Costain brought all parties together to discuss the implementation of the project. They set up collaborative forums - including forums with the supply chain - to de-escalate clashes and highlight core issues as they emerged.



"If I fail, we all fail, but if we succeed, we succeed as a team."

JAMES ELFORD,
PROGRAMME DIRECTOR FOR THE LONDON BRIDGE
STATION REDEVELOPMENT

Network Rail was involved throughout the project. This involvement ensured that decisions and solutions to problems encountered were aligned to the needs of the customer.

The redevelopment programme's approach to contracting, the creation of the Integrated Milestones, and the provision of collaborative forums to ensure people were brought together to discuss issues of implementation, assisted the successful evolution of the London Bridge Station redevelopment.

NEWTON

THE QUEEN ELIZABETH CLASS AIRCRAFT CARRIERS

Newton's experience is that once you have a set of aligned objectives, they need to be put into a single, trusted and living plan.

The plan underpins everything - the sequence of build, the release of engineering information, the supply of materials, the foundation of reliable project controls and governance and decision-making. The plan was the golden thread through programmes that cut through the complexity of delivery.

However, the plan is only valuable when everyone owns and engages with it. To make it constructive, everyone involved in the programme has to work as a team.

One example of how the plan worked on the carrier build was the link between the supply chain, the build and the commissioning programme. Initially, the plan could not identify which individual activities were driving the late handovers between build and commissioning. This was exacerbated by the fact that the build and commissioning teams followed different work breakdown structures. Supported by visibility of the right data, the improvement team was able to pinpoint exactly which individual part occurrences needed to be prioritised for the Commissioning team to meet their plan. By reviewing these priorities with the build and supply chain functions, and understanding their opportunities and constraints, they were able to revise the plan in a prioritised manner, fit the parts on the build team's critical path plan, and minimise risk to late delivery. This work delivered 99% mapping accuracy between schedules, a process to fix schedule issues and critical path prioritised work lists for operations, thereby preventing delays to the commissioning plan.

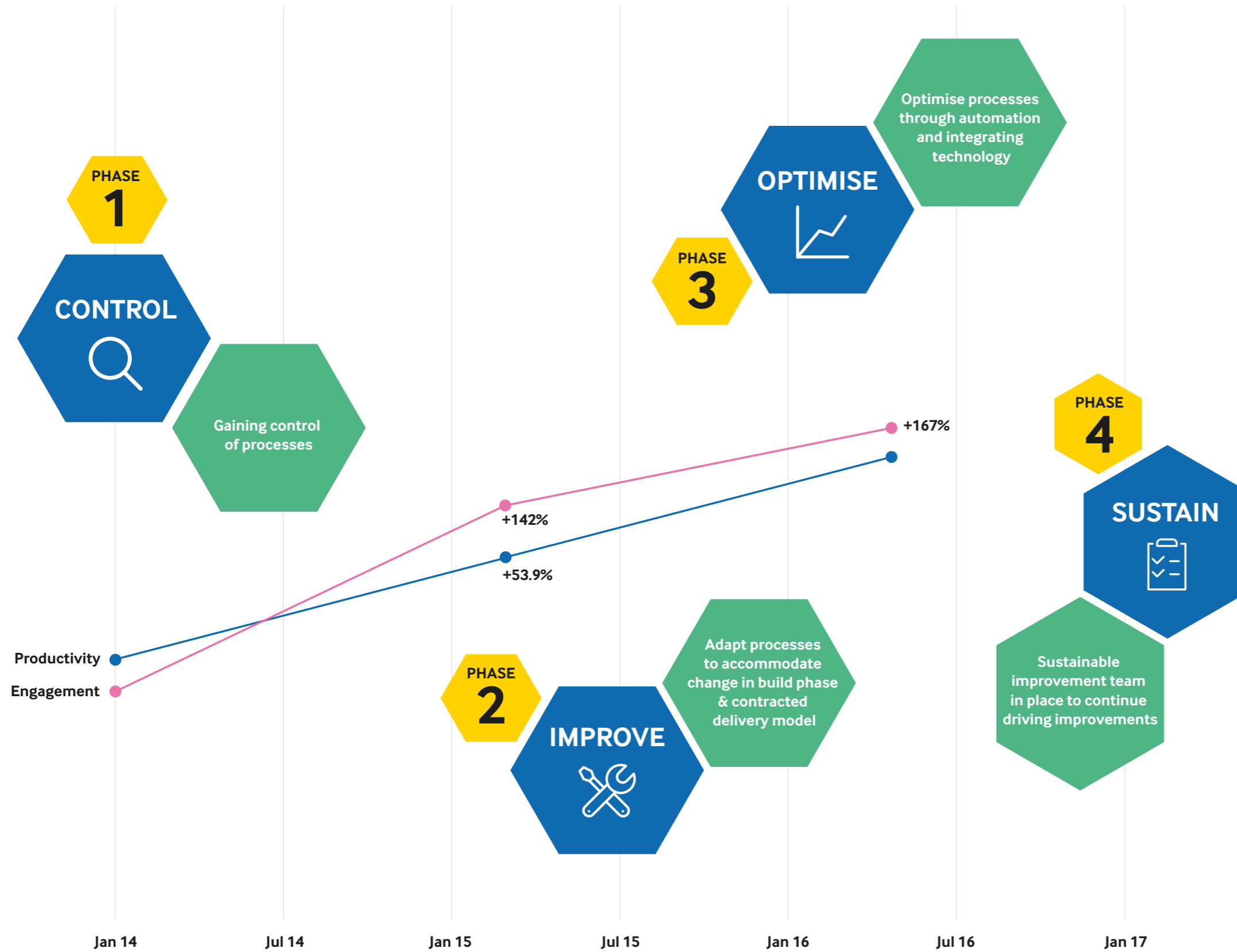


IN SUMMARY

Costain and Newton's experience in the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project respectively, showed that large and complex projects would only succeed if they have:

- A set of aligned and agreed objectives.
- Documented a plan of work and made it accessible to everyone at the right level of detail.
- Ensured there is a consensus around the plan, and that it is understood, agreed and delivered by everyone, from the boardroom to shop floor. Everyone is clear on their role and impact on the plan.
- A pragmatic, collaborative approach to solving the inevitable, emergent obstacles. Establishing a culture that is open to innovating and amending the plan of work in the face of challenges.

THE QUEEN ELIZABETH CLASS AIRCRAFT CARRIERS GAINING CONTROL AND MAKING A LASTING CHANGE



“By listening to, and crucially, acting on the issues highlighted by the teams on the shop floor, workforce engagement increased by 167% and productivity increased by over 50%.”

STEPHAN SMITH,
DIRECTOR OF INFRASTRUCTURE,
NEWTON



PROGRAMME ENABLERS

Newton's research on major programmes consistently shows that, in an average eight-hour working day, around three hours of non-productive time can be attributed to a lack of job enablement.

Enablement is about making sure the workforce has everything they need to finish the job before they try and start it. While this process sounds straightforward, with complex supply chains, heavily interdependent trades and rightly stringent safety procedures, plenty can go wrong.

To make complex projects work, it's necessary to ensure there is a process for rigorous job-readiness checks. Moreover, it's imperative to listen to the teams on the shop floor and crucially, act on what they have said.



THE LONDON BRIDGE STATION REDEVELOPMENT

Costain's experience on the London Bridge Station Development was that enablement involved two important factors.

One, having a process in place to ensure activities are fully system-enabled. For example, at London Bridge, Costain had a system in place that called DRAMPPs - design, resource, access, materials, paperwork and plant. DRAMPPs ensured that they had every job ready to go before the workforce was ready to start it, saving time and money.

Two, and this often gets overlooked, ensuring the workforce feels enabled. That means that everyone should feel empowered, listened to as an individual and see themselves as part of the team.

During the redevelopment programme, the management team used different methods to understand and communicate with the workforce on enablement. One of the simpler ways of communicating was through 'climate' surveys (questionnaires) followed up with 'you said, we did' boards.

Ultimately, however, the most useful way to communicate is to talk to the team members on the shop floor - listening to them, understanding why they are working the way they are and building improvements with them.



For example, the London Bridge redevelopment site employed concrete piling contractors. The team had a more traditional approach and culture and were unaccustomed to the greater safety demands of the site.

Initially, the response was to call out certain ways of working as 'wrong' and approach it from a discipline point of view. This strategy created tensions and cynicism between the team and the other contractors.

This needed to change so time was spent trying to understand the team's way of working. They then worked with the group to demonstrate why the demands at London Bridge were different.

This change of strategy produced a positive response - the team was so converted to safer and more efficient ways of working that they requested to come back for each new stage of the programme.

The 'climate' surveys also showed a 20% improvement in engagement from the workers on the shop floor between 2014 and 2016. By working side by side with the team on the shop floor, ensuring they felt enabled and supported, Costain was able to turn around a potentially risky and cynical team to become motivated champions of its way of working.

NEWTON

THE QUEEN ELIZABETH CLASS AIRCRAFT CARRIERS



At ACA – the partnership which delivered the aircraft carriers – safe working was paramount. Teams could not start their work without the necessary permits and they could experience delays of up to 45 minutes in receiving these permits, sometimes in bad weather.

The programme team knew this issue was important, but they were under pressure to maintain the schedule plus they needed to juggle many other priorities such as customers, safety and changing designs.

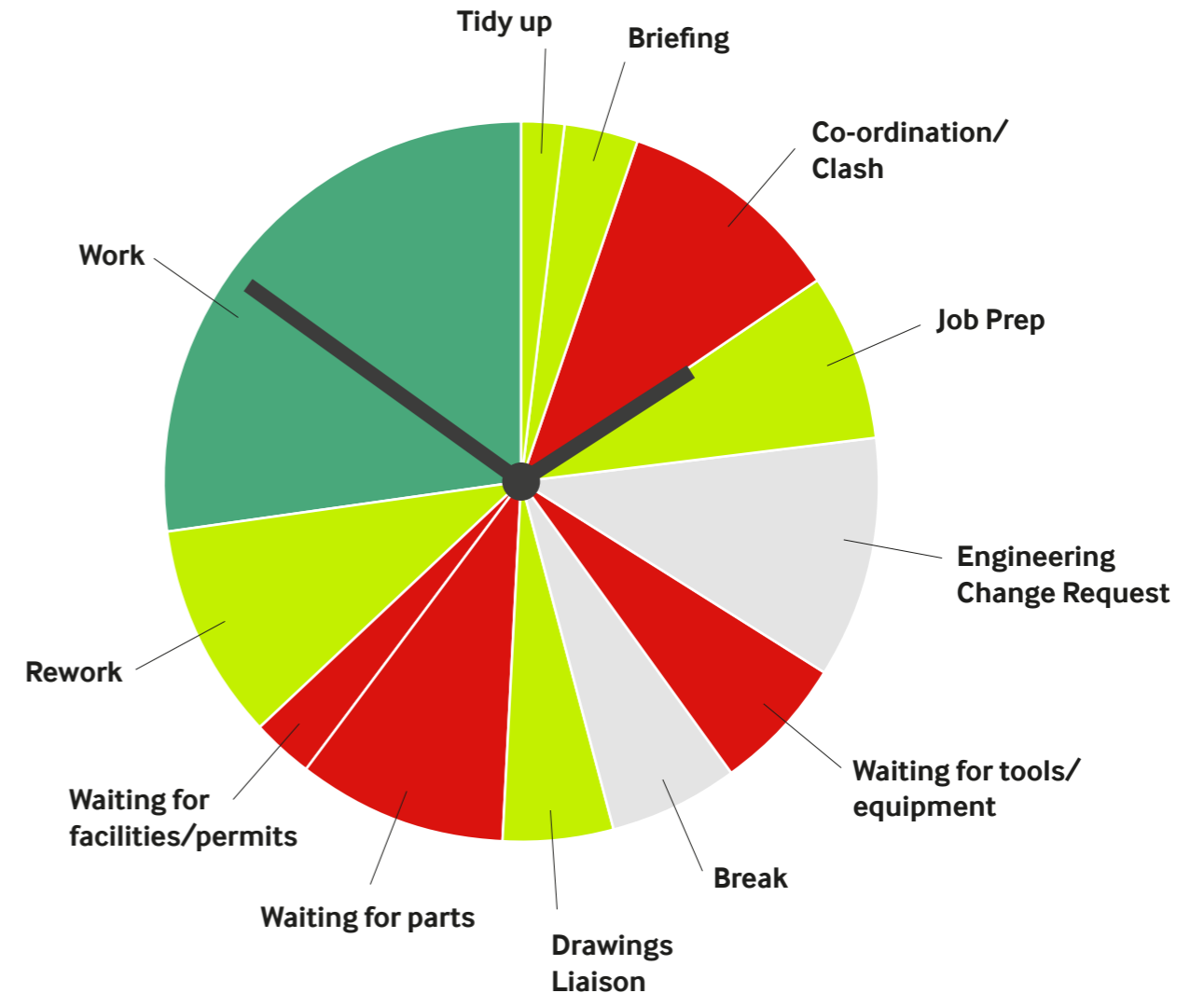
A refocus on engagement and productivity made the case for bringing in a dedicated resource to start to resolve these crucial issues. In the initial assessment, Newton’s analysis showed them that there were low levels of workforce engagement from the teams on the shop floor because they felt that they weren’t being listened to.

When they investigated the permit delay, it was found to be an access issue – there was simply not enough flow in and out of the permit office. A doubling of the number of permit supervisors increased service space and enabled the creation of two doors in and out. Waiting time was reduced from 45 minutes to three minutes.

This example highlighted that communication was vital. In an environment where 80% of the teams on the shop floor were subcontracted, and a third were non-English speaking, mechanisms were needed to coordinate jobs and communicate the plan. The AIM team, created by Newton, coordinated between the ACA partner companies. They implemented a more logical work plan. They made sure each team was working efficiently. Also, through their ‘one goal’ strategy, they improved communication and engagement – for example, bringing in translators to communicate with overseas workers.

As time went on, the teams on the shop floor raised more issues which impacted productivity. Why? Because finally, the teams on the shop floor had begun to trust that the process would solve the blockers that they were highlighting. This change had a knock-on effect on productivity. Workforce engagement shot up by 167% and productivity increased by 50%. Involving everyone in the improvement work, and acting on the key issues, drives engagement.

AVERAGE DAY IN THE LIFE: 460 HOURS OF ON-SHIP STUDIES



IN SUMMARY

On complex build programmes that involve many stakeholders, simpler solutions to challenges can get overlooked.

The London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project illustrates that engaging with, and acting upon, the concerns of the teams on the shop floor are critical in delivering positive impacts in efficiency and productivity.

Engaging at all levels of the programme, from the ‘shop floor’ to upper management, problems can be identified faster and solutions found that can be quickly and cost-effectively implemented. These then bring huge rewards in the form of engagement, safety and productivity.



THE LONDON BRIDGE STATION REDEVELOPMENT

There were several points on the redevelopment programme that required innovation in Costain’s technology and practices.

At London Bridge Station there were enormous complexities involved in the project, especially around the inaccessibility of the site and the tight space constraints within which people had to work. Building many parts of the station on-site would be almost impossible within the timescales contracted. Costain had to innovate.

One example of a highly successful innovation was the installation of the pre-fabricated canopies for the station platforms.

Because the station was operational throughout the redevelopment, the cassettes needed to be brought in overnight and dropped into place. There was no room for error. So the management team made the bold decision to invest in a purpose-built prototyping and test bed facility in Thirsk, Yorkshire. The facility allowed them to model the assembly method in a risk-free environment.

One of the other significant findings from this exercise was that the CATV cabling would not survive transportation and re-assembly. This dilemma turned out to be ‘win-win’. Pulling the CATV cable in one go once the cassettes were installed on site was a more efficient way of working.

By challenging themselves to find a faster way of building the station that would not impact upon quality or safety, the redevelopment team found new ways of de-risking some of the usual pinch-points in the programme.



SMARTER WORKING

“Smarter working means readiness to engage in on-site innovation and technical development.”

On every programme, there are times when what has worked before just won’t deliver.

The London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project exemplified this dilemma. Both had to work smarter on programme pinch-points, innovating to deliver the projects more efficiently and effectively.

With innovation comes risk, both technically and in workplace practices. Investing time and resources into prototyping these risks introduces certainty into innovation by offering an opportunity to test them in an experimental environment before they are fully implemented.

NEWTON

THE QUEEN ELIZABETH CLASS AIRCRAFT CARRIERS



On the carriers, one pinch-point was the LV cabling and switchgear programme in the aft end of the ship. Getting this right was necessary to hit key commissioning dates for the ship-wide power and propulsion system.

The main issue was that the build was not completing the outfit in the compartments in time for the cabling to be pulled.

By studying what was happening at the front line, Newton saw that although sufficient volume was being completed, not enough of the critical jobs were progressing because they didn't have everything they needed from the support functions to start the job. Furthermore, trades had no clarity on when they'd be able to get into the compartments.

Even though the build team had a plan showing where the priority was, it was not live or visible to the groups who needed it most.

The idea of a 'live plan' had long been an aspiration of the site teams. However, the challenge of sharing security-controlled data with a diverse contractor base, and on a building site inside a steel box with a limited network and power had always seemed insurmountable. With the need to accelerate the critical path pressing, however, it was recognised that innovating was going to be necessary to maintain the schedule.

The team developed a simple plan view that they called the ePal (Electronic Plan Activity List). The ePal showed the enablement status of every job. A team of rapid developers evolved and inputted a prototype tool with live data in the on-ship daily planning meetings. This tool identified precisely what was needed to make the work more efficient.

As a result, the pace started to pick-up on-ship.

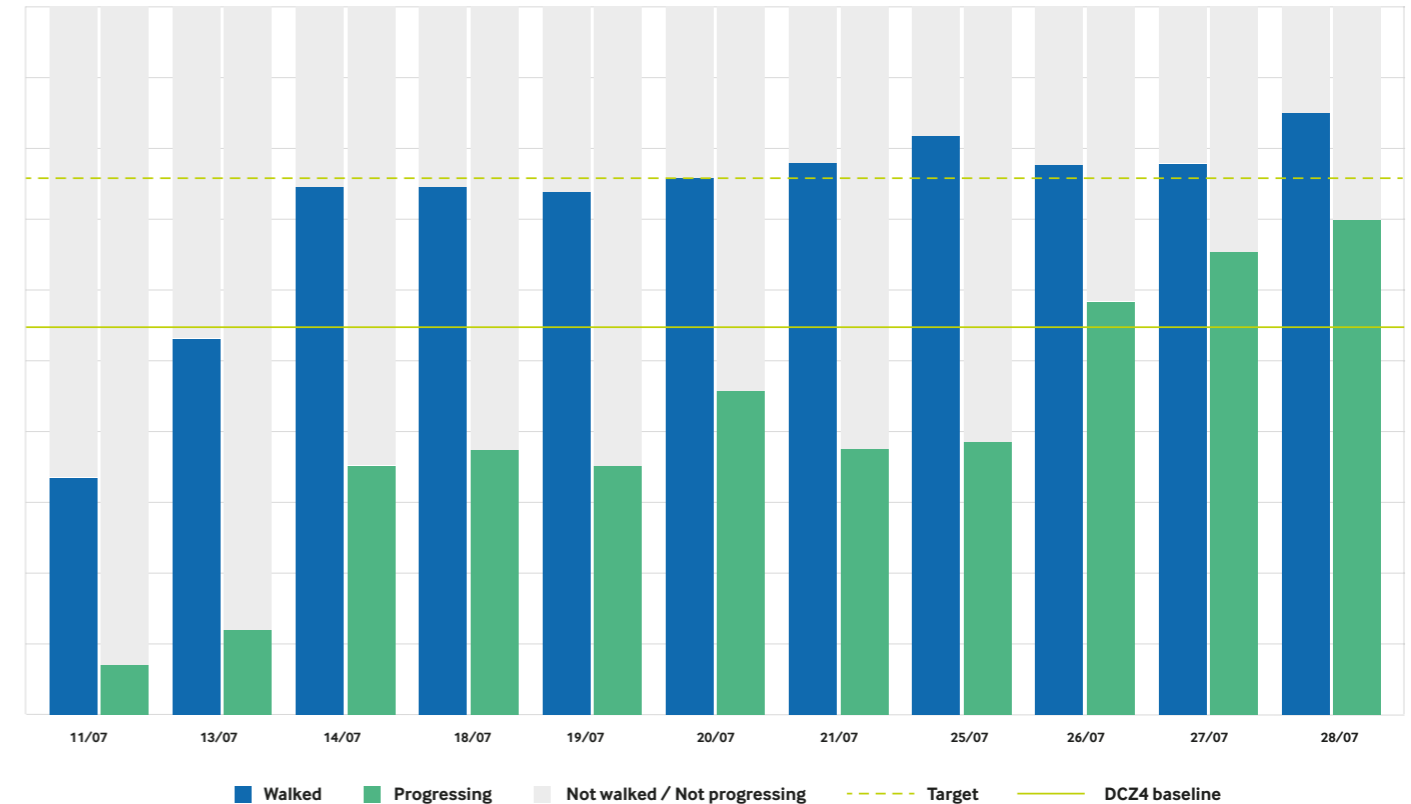
It soon became clear that the tool also needed to show supporting functions the same plan priority as the on-ship teams so they would know where to focus.

The ePal progressed over a six-week period and eventually led to a ten-fold improvement in the number of critical path activities operating as they should.

Not only did the programme now have a more efficient implementation, but the team also had an entirely new way of working that was rolled out across the ship. All functions of the build knew the live status of every job. They knew which jobs were the top priority to hold the schedule and keep the teams working efficiently.

Moreover, real-time visibility allowed the monitoring of performance (against the Service Level Agreement) of any trade or supporting function based upon trusted data owned by the teams themselves.

JOBS CHECKED FOR READINESS TO START AND COMPARTMENTS ON THE CRITICAL PATH PROGRESSING



IN SUMMARY

The experience of the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project demonstrated that innovations are necessary to ensure smart working, both in the technologies used and the implementation of the projects.

By prototyping innovations, the teams can minimise risk and implementation will be smoother.

The innovations developed by both projects meant a substantial increase in efficiency, while also ensuring site safety and the maintenance of quality.

CONCLUSION

Large-scale infrastructure and defence programmes are often controversial, their ambition and technical advances matched by delays and obstacles.



Comparing the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project has been invaluable. The two programmes had significant elements in common, and illustrated the need to create a clear and agreed set of objectives and a plan - and then to improve pinch-points in delivery by ensuring a cooperative workplace culture and technological innovation.”

IAN PARKER,
SECTOR DIRECTOR - RAIL, COSTAIN



The key with complex programmes is that it is demonstrably possible to improve them once they go off track, but it's always better to get it right up-front. The role of companies like ours is to find ways to improve the efficiency of projects while maintaining safety and quality.

“By comparing the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project, we have found three identifiable areas – shared focus, programme enablers and

smarter working – which, put together, will advance more effective implementation of large and complex projects. We hope that the process of learning that we have undertaken will produce more positive headlines for ambitious infrastructure projects in the future.”

STEPHAN SMITH,
DIRECTOR OF INFRASTRUCTURE, NEWTON





Companies involved in sizable and complex projects benefit from considering how they can improve. By comparing two complex engineering programmes - the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project – Costain and Newton have outlined three findings:

THE IMPORTANCE OF SHARED FOCUS

Costain and Newton's experience in the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project demonstrated the need for aligned and agreed objectives, a plan of works, consensus from all parties involved about the aligned objectives and plan, and having the flexibility to amend and develop the plan during the process of implementation.

These practices encourage a shared focus and motivation for all parties involved in the programme to work as a team.

THE NEED TO UNDERSTAND PROGRAMME ENABLERS

On the job time can be lost by not understanding what participants need to complete each activity. These are the programme enablers and include equipment, tools, procedures and all work safety requirements.

It is necessary to understand and check job readiness by listening to, and acting upon, the concerns of the teams on the shop floor.

The London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project illustrates that engaging with the concerns of the teams on the shop floor and implementing changes based on feedback has positive impacts on efficiency and productivity.

THE IMPLEMENTATION OF SMARTER WORKING

The experience of the London Bridge Station redevelopment and the Queen Elizabeth Class Aircraft Carriers project show that companies need to be responsive to the need to innovate on-site. Developing new methods, adaptations to existing technologies or evolving new ways of working will ensure smarter working.

It is essential to prototype innovations to guarantee fewer risks and obstacles to implementation.

By being prepared to innovate and work smarter, both projects noted a substantial increase in efficiency while not compromising safety and quality.





AUTHORED BY

IAN PARKER, COSTAIN

SECTOR DIRECTOR - RAIL, COSTAIN



Ian Parker leads Costain's rail business.

Ian is a Chartered Civil Engineer with over thirty years' experience in the infrastructure sector, working with construction and consultancy organisations and in client roles. He has been responsible for multi-billion pound infrastructure investment programmes and currently leads a team which is delivering projects and programmes for Network Rail, Crossrail and High Speed 2.

STEPHAN SMITH, NEWTON

DIRECTOR OF INFRASTRUCTURE, NEWTON



Stephan Smith leads Newton's infrastructure strategy.

Stephan has significant experience in the maritime and defence sectors where he led the Newton team to deliver £100m+ of benefits on the Queen Elizabeth Aircraft Carrier programme by improving productivity and reducing the build schedule.

CONTRIBUTORS



Mark Howard
Costain



James Elford
Costain



Tom Pope
Newton

IMAGE CREDITS

Front Cover, P3, 5, 6, 7, 12, 15, 24, 29, 33, 37, 39: Kindly provided by the MOD. Contains public sector information licensed under the Open Government Licence v3.0

P28: Kindly provided by Network Rail

With thanks to the





ABOUT COSTAIN

Delivering Smarter Infrastructure

Costain is a smart infrastructure solutions company that helps to improve people's lives by deploying technology-based engineering solutions to meet urgent national needs across the UK's energy, water and transportation infrastructures. They deliver a range of innovative services including consultancy, technology, asset optimisation and complex delivery within high-profile UK contracts. They have been shaping the world in which we live for over 150 years.

Costain House
Vanwall Business Park
Maidenhead
Berkshire SL6 4UB

+44 (0)1628 842 444
info@costain.com
www.costain.com

NEWTON

ABOUT NEWTON

Delivering Infrastructure Smarter

Newton specialises in driving operational and financial performance across the public and private sector, from complex engineering programmes to mass-production manufacturing and through-life support programmes. They achieve this by pinpointing and implementing the changes that will make the most significant difference to programme performance and platform availability. They uncover the data that means the most critical decisions are made with facts, not opinions. Moreover, they bring together a group of people who live and breathe delivering results.

2 Kingston Business Park
Kingston Bagpuize
Oxfordshire OX13 5FE

+44 (0) 7971 746 250
info@newtoneurope.com
www.newtoneurope.com

You can view a presentation on the findings of this report at
www.newtonandcostain.com