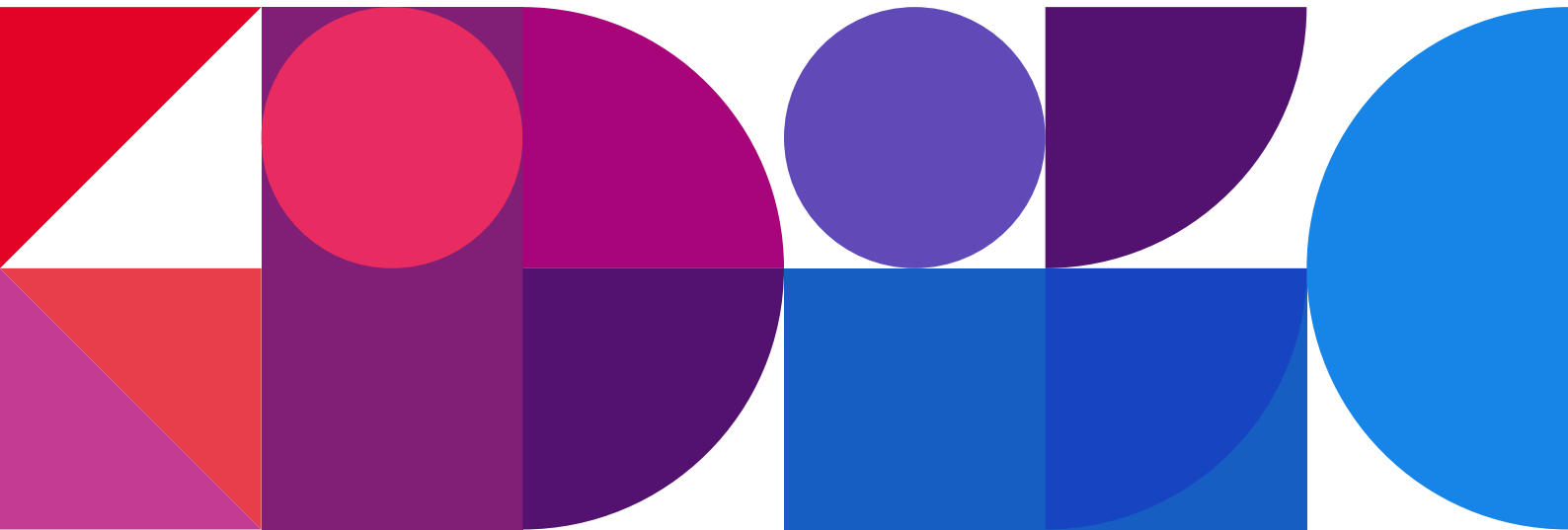




**BOURTON
GROUP**

From Construction to Production.

An eight point plan to
transform the sector



Your Business.
Better.



Introduction

The UK Construction and Infrastructure sector is in a period of major change.

We are entering a period of major investment in the construction sector with high demand for construction capacity from Nationally Significant Infrastructure Projects, such as HS2, Crossrail 1 & 2, and Hinckley Point. In addition there are high levels of investment in all areas of infrastructure and utilities including road, rail, power generation and water.

This sustained increase in demand will lead to severe pressures on the cost and timescales of such projects. Our belief is that by undertaking construction projects in the old, traditional 'tried and tested' way, the industry will not deliver the performance levels needed to meet new challenges.

Construction companies need to find challenging and innovative new ways to deliver their projects which will dramatically reduce time on site and simultaneously reduce costs whilst maintaining excellent quality. This position is not a new phenomenon; other sectors have been through similar journeys and those who embrace the changes come out stronger and better able to compete at the highest level.

This white paper examines some of the issues which are constraining performance in the construction sector and identifies an eight point plan which will provide the foundation for challenging existing thinking and developing innovative high performing ways of working. None of this is new or radical but the sector now has an opportunity to seek out, learn, adapt and apply established thinking from other sectors.

● **Tim Washington**
Partner at Bourton Group LLP





This white paper explores some of the issues around the construction sector challenges, and identifies eight key actions where construction can learn from other sectors and transform performance.

Learn from others and steal a march on your competitors. The UK construction sector is facing major challenges over the next decade and beyond:

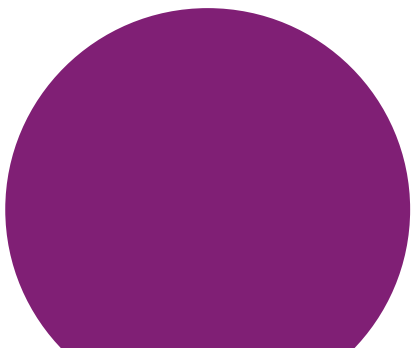
- Increasing population in the UK is driving construction demand up
- The Sustainability Agenda is driving a need to find new ways of working and methods
- Increasing pressure to reduce overall costs as outlined in Construction 2025
- Increasing pressure to reduce overall programme timescales and meet delivery timescales consistently
- Demand potentially outstripping supply leading to skills and broader capacity shortages
- Failure to adopt ways of working proven in other sectors
- Step changes in performance from global players entering the UK market
- Timely adoption of new technology such as BIM (Building Information Modelling)

Bourton Group has a rich history of working in a wide range of industrial business sectors and firmly believe that there are always opportunities to learn from others. For example, the banking sector 20 years ago was a very traditional area of commerce, driven by its own paradigms and ways of working, with long process cycle times and poor customer service.

The sector eventually realised it was fundamentally a paper/information factory and employed many principles from manufacturing to manage workflow, reduce cycle times, improve quality and transformed the way it interacts with customers.

It is now quite common (and indeed encouraged) to find people working in banking whose background is in manufacturing. 10 years ago, the mention of, for example, automobile or aerospace manufacturing in the construction sector was severely frowned upon as being of little relevance but in reality there are many parallels and lessons to be learnt. We now find that the most forward thinking construction companies are actively seeking new ways of working from other sectors, which is fuelling the 'from construction to production' factory thinking movement.

This white paper explores some of the issues around the construction sector challenges, and identifies eight key actions where construction can learn from other sectors and transform performance.



01. Integrate design into the end to end construction process

The construction sector design process can often be disconnected from construction site processes. The impact this has is to extend overall timescales and drive unnecessary design complexity or 're-inventing the wheel'. This can then drive up the number of technical queries, costs and generate an 'over the wall' culture which is unhelpful in fostering true partnership working.

We see best in class performance in this area in engineering manufacturing businesses where concurrent engineering (i.e. designers working in parallel with production and process engineers) has been successfully deployed. In conjunction with concurrent engineering, other valuable features deployed are the use of modular designs, rapid configuration from base designs and the use of Enterprise Resource Planning systems to link effectively with the rest of the business.

For concurrent engineering to be really successful, it needs excellent IT systems (Computer Aided Design/ Computer Aided Engineering/ Enterprise Resource Planning), highly skilled and flexible engineers in design and production and a genuine desire to work in a collaborative way.

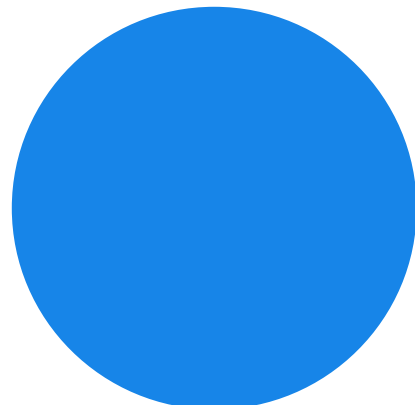
For the Construction sector, the opportunities that BIM and Collaborative Planning offer in this area are very real. Maximising the value of BIM modelling and getting design and site engineers working in the same office, with the same objectives would give major benefits to overall construction programmes. However, there are some obstacles to be overcome to achieve this, for example, the commercial arrangements for the design contracts, the physical location of designers and site engineers and cultural differences between design and production.

If it is any consolation, these were all originally barriers to the successful adoption of concurrent engineering in the manufacturing sector!



In 2009, Highways England successfully used a collaborative approach in the design and construction phases of the M53 Bidston Moss Viaduct Strengthening project. Collaborative planning was established early in the design phase and deployed on all further activities. Integrated project meetings, weekly in design and daily for construction were used to set programme targets, establish which tasks in the plan have been achieved and identify key barriers to progress.

In design, collaborative planning drove better communication and transparency helping to improve commitment reliability by 34%. This enabled the project to meet an accelerated design programme and complete Phase A, one month ahead of programme. Commitment reliability in construction improved from 78% to 90%; realising an overall benefit of over 3% of scheme value.





02. Steal with pride best-in-class supply chain management and logistics practices



An area that provides significant potential for Improvement in the construction sector is supply chain management and logistics. We believe that currently, moderate supply chain performance is too often considered normal; excuses for poor performance are accepted and real partnerships are few and far between. We see best in class supply chain management in aerospace and automotive supply chains, where true partnerships have been developed over many years – it does not come easily, especially in traditional business areas.

There, 'Just in Time' (JIT) principles are thoroughly understood and deployed relentlessly to continually improve performance. Some of these industries are admittedly high volume arenas where JIT fits very comfortably but aerospace for instance is a low volume, high value work environment where JIT has been deployed equally successfully. We see the key issue to be addressed in Construction Supply Chain Management is a move from the contractor mentality to the development of true partnership arrangements and contracts where achievement of common objectives gives mutual benefit.

Collaborative planning is a great help in promoting supply chain excellence but will not achieve what is needed when deployed in isolation.

Just-in-Time principles were used in construction as far back as the early 1930's: The Empire State Building was the highest building in the world for forty years. With 102 stories constructed in 11 months, the steel frame rose more than a storey a day.

For years automotive manufacturers have been operating tight delivery windows for smaller suppliers to overcome very low levels of inventory, and close alignment of production requirements of the assembly plants.

In the construction of the Shard, innovative JIT approaches were used to ensure an on time finish date and within budget; with minimal impact and disruption.





03. Customise production and manufacturing techniques for the construction and infrastructure environment

It is a commonly held view in construction that the manufacturing industry is all about high volumes and therefore any techniques used successfully there are inappropriate for the bespoke, low volume world of construction. It is our belief that the vast spectrum of manufacturing environments, from fast moving consumer goods and automotive manufacturing to the bespoke production of capital goods (e.g. power generation equipment), are industries from which construction can both adopt and adapt new ways of working.

Factories with varied volumes and complexities are great places to learn a wide range of transferrable techniques, such as: visual management; use of process data (such as Overall Equipment Effectiveness and Statistical Process Control); capacity planning and production control; modular build and employee engagement driving ongoing continuous improvement. Construction needs to consciously adopt a production mentality, deploying 'factory like' processes and fully embracing modular design and build and 'build off site' principles.

Examples such as Aircraft Maintenance and Repair Operations, where deep maintenance programmes have unknown work content until a diagnostic has been undertaken and all emergent work quantified (similar to site ground condition surveys), provide parallels with construction in terms of complexity, prevailing timescales and the ultimate need for process excellence.

We would encourage forward thinking construction managers to visit an aircraft maintenance facility to see what can be achieved in a bespoke, complex environment.

Nottingham City Council built a new 1,200 pupil secondary school in less than 12 months with a tailored design focussing rooms to deliver additional support for pupil attainment using offsite construction methods. Each bespoke 'module' was built and fitted out offsite in a 'factory' environment (dry, warm, light and clean). The company behind this innovative approach to construction in the schools sector is now applying this thinking to a number of schemes in Sandwell.

Mike Smith, Senior Deputy Head Teacher at The Phoenix Collegiate Sandwell said,

"Despite being the biggest school build in the country at the moment for over 2,000 pupils, on what must be one of the most difficult of sites due to mine shafts and it being a previous landfill site, the way in which this building is being constructed means that we will have a fantastic new teaching and learning facility within 20 months of the start on site. This is much earlier than we had anticipated which will allow us to continue to build a great developmental environment for our pupils and a great place to work for our staff."



04. Professionalise your equipment maintenance regime

30 years ago, plant breakdown would be considered a fair reason for production stoppages in industrial environments. Disciplined application of techniques such as Total Productive Maintenance, Condition Monitoring and Reliability Centred Maintenance have rendered unscheduled plant down time a thing of the past in best in class facilities.

The use of OEE (Overall Equipment Effectiveness) has driven organisations to quantify down time and use Root Cause Analysis techniques to understand and solve the causes of a breakdown.

The construction sector, both new build and repair and maintenance is highly dependent on capital plant and yet seems to often accept breakdown as a routine part of the job. We were working recently with a client who scheduled additional road re-surfacing pavers to be available to provide back up for the anticipated breakdown.

This thinking needs to be challenged to prevent breakdown and the improvements in productivity and costs will follow.

The UK Rail industry has been focussing on maintenance and reliability of High Output Construction trains for a number of years and several large tunnelling projects, including Cross Rail have concentrated on keeping the equipment in use. During Crossrail's tunnelling phase, each Tunnel Boring Machine was operated by 'tunnel gangs' comprising of around twenty people. Increased equipment reliability enabled the tunnel gangs worked in 12 hour shifts, tunnelling 24 hours per day, seven days per week.



05. Understand whole life costs to change your delivery model

Some manufacturing sectors are starting to move away from the traditional model of producing a product that is simply sold to a customer. In the world of the humble PC printer, manufacturers have extended their reach, effectively allowing customers to base their commercial relationship on the number of documents they produce as opposed to the simple procurement of the equipment. This has allowed them to significantly increase their opportunity to add value. Businesses in these sectors have a deeper understanding of the whole life costs of the products and services they provide and use this to drive improved performance and increased revenue.

The construction sector has lagged behind with traditional contracts and relationships between client, designer, contractor and supply chain driving inefficiency and waste. By taking a more proactive approach to the complete end to end life cycle, improvement potential can be significant.

With active participation from the supply chain, Highways England are leading a review of whole life costs and associated processes involved in the design, extraction, processing of materials, re-surfacing and ongoing repair and maintenance of road surfaces throughout its network. This is intended to provide considerable contribution towards the Highways England efficiency target of £1.2b during 2015 – 2020.

06. Embrace and exploit what the latest research has to offer

The construction sector is already making great use of technology such as GPS guided machinery, use of handhelds on site to reduce paperwork etc. It is quite easy to envisage the construction site of the future being controlled from a central operations hub where the position and movement of all plant and people is known and controlled through GPS tracking, where automated equipment controlled via BIM and GPS undertake groundwork in the most efficient way possible (very much like automated farming) and 3D printing type techniques are being used for structure development.

Now China can claim another title - the fastest builders on the planet after putting up a 30-storey 183,000-square-foot hotel in just 15 days, or 360 hours. A construction crew in the south-central Chinese city of Changsha completed this remarkable achievement with no injuries to any worker.

The Ark Hotel was built on Dongting Lake, in the Hunan Province, by Broad Group, a Chinese construction company which specialises in sustainable architecture. It was built to withstand a magnitude 9 earthquake, as tested by the China Academy of Building Research, who claim this is five times more quake-resistant than conventional buildings. All the materials were prefabricated and sections built to specification off-site, so there was very little wastage. The builders took just 46 hours to finish the main structural components and another 90 hours to finish the building enclosure.



07. Spread the zero harm culture to all areas of the organisation and your supply chain partners

We observe that this is an area where the construction sector has truly grasped the need to deploy a different way of thinking about their work to effect a cultural change. The results in terms of accident numbers have been positive and quantifiable, which is fantastic but it is the cultural shift which is starting to gain traction. It shows what can be done when there is a real desire. The areas that still require attention are the knowledge workers in construction and the supply chain partners at first second and third tier levels.

We believe that with the same desire to deploy Lean Sigma based process improvement (aka factory thinking), the results on programme performance could be just as remarkable. After all, how much is different between a culture of don't walk by safety hazards to a culture of don't walk by waste?

There has been a sustained reduction in workplace injuries within the Construction sector since the start of the new millennium. Across the period from 2001/2 to 2014/15 the rate of injuries has fallen by around 40%. In parallel with this fall, there has been a noticeable change in attitude to safety and risk within the sector with Business Leaders starting to take a more proactive role in striving for behavioural change.



08. Use your people to spread best practice

All these changes in the way that organisations think and do things will require a major change in people's attitude at all levels. Embracing change of this nature will be daunting. In organisations we often hear 'we've never done it that way'. We suspect that the sector will be reluctant to change unless it becomes too painful to stay the same. There is an emerging sense of dissatisfaction with how things are done but there needs to be clear leadership of how engaging the future will look and to generate confidence in the steps to make the change happen.

Many people will remember the stories that emerged in the late 1980's from the new Nissan plant in the North East. 'That way of working will never work here' 'This Lean way of working will never succeed', 30 years on, it's one of the most productive car plants in the world and an exemplar of modern factory thinking and staff engagement. This was achieved by developing people and engaging them in how work was done. Once engaged and on board, staff who get it, will commit more than ever to making things better. The secret is to invite them to shape changes and to leverage on their skills and experience.

Modern, effective, high performing and reliable organisations defer to the knowledge holders who are closest to where things are actually produced. Equipping those people with the tools and techniques is essential to succeeding in changing from merely constructing to efficiently producing.

Highways England are driving their supply chain to adopt Lean Construction thinking and methods to facilitate improvements in efficiency, quality and lead times. They also have a proactive internal Lean Deployment programme currently being rolled out within the organisation.

A key element of this is the adoption of a network of Continuous Improvement Cells (CICs) that seek to engage employees and to establish a continuous Improvement ethos throughout. The CICs offer a mechanism to cascade performance targets and achievements throughout the organisation meaning all teams can focus on their own contribution to improving performance through the use of Lean performance improvement tools and techniques.

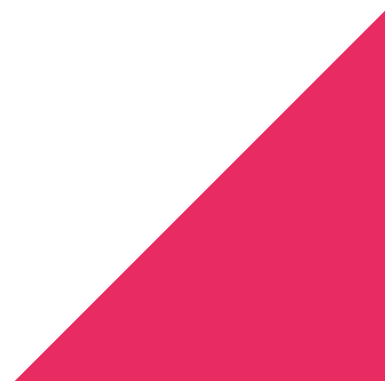
Words of warning

We passionately believe that there are great opportunities for the construction sector to grasp the application of proven techniques from other sectors to help meet the increasing operational pressures on cost quality and delivery in the sector. However, a few words of warning:

- Beware of justifying the status quo because construction is 'different'.
- It is up to business leaders to grasp the nettle and drive the necessary changes - if they don't, the changes needed to meet the requirements of the future will not happen.
- ▶ Beware of automating a poor process through investment in IT and technology - the result will still be a poor process but now hard wired into the business.

What next?

If you are serious about adopting factory thinking for the benefit of your organisation and your clients, you will need to understand your start point. We can help by assessing your position on the Construction to Production continuum and will help you to form a sighting plan which articulates the goals, the case for change and the outline implementation timescales.





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If you would like to find out more about how Bourton Group can help to fix your business. And help it to stay fixed. Please give us a call 01926 633333.



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