Improving Leadership in Manufacturing Productivity

How good is your business really?
Introduction from the Chair

I'm delighted to be able to introduce this ‘Improving Leadership in Manufacturing Productivity’ work, which is supplementary to the overall Productivity Leadership Group (PLG) report ‘How Good Is Your Business Really?’.

I have had the pleasure of working with some of UK’s top manufacturing leaders on this report, representing both large and small companies. I'd like to thank them all for their tremendous contribution and commitments. You will see in this report our pledge to continue to support this work and ensure we help drive UK’s manufacturing productivity over the next decade.

Our work has been very practical in nature. Offering what from our experiences of leading some of UK’s most productive factories, are the key success factors. The Manufacturing Productivity Framework describes these clearly and the case studies are aimed at providing some practical guidance and ideas.

We believe that there is a huge prize to be gained from all of the UK’s manufacturing sector engaging with some of the ideas generated in this report. We however only see this work as the beginning. Our aim is to sustain this work, and to create a much stronger national movement for driving productivity and with a high level of ambition. We envisage this to happen through a newly formed Productivity Council, which is a key recommendation of the main PLG report.

The recommendations for Industry and Government to work and collaborate on to improve manufacturing productivity are clearly laid out herein. They aim at driving a higher level of ambition, greater investment in technology and on improving employee engagement. All supported by more stable and coordinated policy and support mechanisms. However, our key measure of success will be the number of manufacturers this report spurs into becoming more curious, and taking some positive action as a result. We hope you enjoy reading the report and it encourages you in such a positive way.

Finally, I’d like to thank the CBI and EEF for providing their highly professional advice and research, as well as Adam Crook and Lesley Giles who kept us coordinated and skilfully turned our thinking into these final words.

Juergen Maier, July 2016
How good is your business really?

Manufacturing Leadership Group

Professor Juergen Maier
Chief Executive
Siemens UK

Neil Carberry
Director
CBI

Roger Connor
President - Global Manufacturing & Supply
GlaxoSmithKline

Roy Freeland
President
Perpetuum Ltd

Lee Hopley
Chief Economist
EEF

Justin Kelly
Business Development Director
Siemens UK

Jo Lopes
Head of Technical Excellence
Jaguar Land Rover

Dr Hamid Mughal OBE
Director of Global Manufacturing
Rolls-Royce

Charlie Overton
Manufacturing Business Office Director
Jaguar Land Rover

Andy Page
Chief Executive
Sharing in Growth

Tony Walker
Deputy Managing Director
Toyota UK

Adam Crook
Assistant Director - Manufacturing
Department of Business, Innovation & Skills

Lesley Giles
Deputy Director
UK Commission on Employment and Skills

Secretariat:

Adam Crook
Assistant Director - Manufacturing
Department of Business, Innovation & Skills

Lesley Giles
Deputy Director
UK Commission on Employment and Skills
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Why Improve Manufacturing Productivity?

Manufacturing is important to the UK economy. Manufacturing generated £168 billion GVA in 2015, equivalent to 10.3% of the UK economy, and employs 2.6m people (8% of the UK workforce).

Historically, parts of the UK’s manufacturing sector have given rise to some of the strongest productivity gains – notably transport equipment manufacturing, chemicals and pharmaceuticals. Overall, the sector has seen output per hour increase by an average 2.7% per year since 1971, a full percentage point faster than productivity growth in the whole economy.

UK manufacturers have a legacy of catch up and convergence. Crucially, UK manufacturers have not always been laggards compared with our European competitors. From a relatively weak starting point at the turn of this century, UK manufacturers embarked on a period of catch up and convergence which saw annual rates of productivity growth leapfrog the EU average (see chart). This solid productivity track record came to an abrupt halt during the financial crisis and the sector’s performance has been below par in the intervening years.

A range of factors have all helped to apply the brakes on manufacturing productivity growth, such as: lower levels of investment in capital and innovation; continuing financing challenges for SMEs; the higher level of exposure to oil and gas activity; the low oil price; and longer-standing challenges on skills development and technology adoption.

Looking to the future, manufacturing must get back on a stronger growth path. For the UK to get on top of its productivity puzzle, our manufacturing sector needs to regain its position nearer the top of the European productivity league table. A return to pre-recession productivity growth rates would see output per hour in manufacturing 25% higher in 2020 than current levels. Analysis from McKinsey indicates that, if businesses raise their performance nearer to the top quarter of manufacturers, the potential benefit to the UK could be in the region of £10bn.¹

The UK manufacturing sector will also need to increase its capacity to adapt in the face of a rapidly changing environment. We expect to see continued globalisation of manufacturing value chains, intensification of global competition, rapidly changing patterns of consumer demand, increased scarcity of energy and resources, as well as the radical impact of technology “shocks”.

These trends could entail fundamental changes to products, manufacturing processes and systems and business models, which will be better handled by a manufacturing sector with a

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culture that encourages high-performing management, employee engagement and uptake of innovation and new technologies.

The quality of management is strongly associated with the performance of a company; therefore improving the quality of management as described above will impact positively on the company’s productivity. Research shows that just a small increase in management capability is associated with significant increases in productivity, as well as benefits to profitability, sales growth, market value and survival.²

The UK’s position in management quality of manufacturing organisations is middling and lies below the “Premier League” of countries led by the US (which the UK lags by around 60%), but also including Germany, Japan and Sweden. According to some academics,³ about one quarter of the productivity gap between the UK and the US is associated with issues around management and leadership.

We believe that this change is possible, and that world class industrial companies can offer leadership. We have found fantastic examples of excellence and ambition across industrial sectors in the UK, and know that this is just the tip of the iceberg. A number of leading companies are already taking action to develop talent across organisations, invest in technology, innovation and process improvement, all spearheaded by a clarity of vision from the leadership and a culture of continuous improvement.

While these are not isolated cases, these traits need to be more pervasive across UK manufacturing, and in companies of all sizes, to deliver the step change in productivity growth that the sector needs to be internationally competitive and to support higher levels of growth.

**How to Improve Manufacturing Productivity?**

Members of the Manufacturing Leadership Group have drawn on their own experiences, supplemented by a qualitative series of interviews of senior managers at leading companies with a significant UK presence, to identify the actions connected to leadership and management that manufacturing businesses can take to improve their productivity. We have brought these together to create a simple framework (see below) to help leaders and managers to identify steps that would be appropriate for their businesses.

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³ Nicholas Bloom, Raffaella Sadun and John Van Reenan (2015), ‘Management as a Technology’
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The framework is structured around the following areas:

- Leadership and Ambition
- Innovation and Technological Step Change
- Skills, Culture and Employee Engagement
- Structural Support Policy

The actions that we recommend business leaders consider are set out on page 7. While improving productivity takes sustained effort over a long period, the actions needed are often common sense. We have brought this to life through a series of case studies showing examples of how companies have already worked to improve their productivity. These can be found in the Appendix to this report.

We recognise that not all of these actions are appropriate for all companies, depending on the nature of their business, but feel that this framework is transferable beyond the manufacturing sector from which this originates.

We have tested our findings with a number of groups, including the aerospace sector companies involved in the Sharing in Growth programme, the Greater Manchester Manufacturing Champions Network, and through business representative organisations such as the EEF and CBI. The feedback we have received has been used to refine our thinking, and to inform our views on what businesses and Government will need to take forward in the future to drive a step change in manufacturing productivity.
Leadership & Ambition
- Set a clear vision and strategic direction through an inclusive approach
- Clearly articulate the need to change
- Ensure the vision and need to change is connected to the customer
- Align effort from top to bottom
- Clearly demonstrate how better productivity is better for staff, including in improving the workplace environment
- Define performance standards – focus on the vital few – control and then improve
- Develop and empower leaders at all levels to be effective problem solvers able to coach continuous improvement skills and techniques
- Invest in leadership development and behaviours
- Achieve change through people and culture
- Track progress in a proportionate way understandable by the workforce
- Drive a business wide culture of empowerment, encouragement and relentless continuous improvement
- Create an organisation that is obsessed with targeted process productivity to deliver the required outcome
- Incorporate best practice and quality systems from an early stage

Skills, Culture & Employee Engagement
- Develop the skills of both existing staff and new talent as part of systematic workforce planning
- Develop the capability (skills and techniques), mindset and behaviours associated with the use of LEAN tools and techniques.
- Lead significant culture change programmes with a high level of engagement, recognising that culture change takes time to take root, requires Behavioural change at all levels of the organisation and requires constant attention
- Behaviours at all levels demonstrate the company values
- Expect that process improvements can be identified and delivered by an empowered workforce from the bottom up, including reducing variation of processes and building in quality at the root
- Develop a high focus on benchmarking / external awards e.g. BQF (EFQM), best factory awards etc
- Celebrate successes of all sizes through an appropriate recognition/reward system.
- Form true partnerships with suppliers
- Bring employee representatives on the journey – including national bodies as required.
- Recognise the need to treat investment in people at least as importantly as for capital equipment.

Manufacturing Productivity Framework
Steps for businesses to take

Innovation and Technological Step Change
- Ensure that underlying processes are robust before considering automation; new technology introduction requires management
- Look for significant cost optimisation opportunities in manufacturing processes and invest in production technology
- Take a longer term view of investment in product development and production
- Design products for automation (even if automation is not implemented)
- Design products for productivity – late stage customisation
- Design new manufacturing lines for flexibility without losing productivity
- Optimise management of supply chains
- Develop a culture of embracing new technologies quickly with confidence
- Drive uptake of innovation / R&D in collaboration with universities / catapults / suppliers / customers etc
- Consider continuous business model innovation across the entire value chain

Structural Support Policy: Steps for Industry
- Look around the marketplace for good practice, and engage with others who you can learn from
- Improve awareness of support schemes for manufacturers, and how to access them (e.g. tax credits, Catapult centres, development grants)
- Make use of financial products and access to finance, including export finance
- Participate in strong ecosystem for engagement of companies in innovation (e.g. Catapults, business networks)
- Encourage large companies to mentor and develop the capability of SME’s in their operating locality and supply chains and recognise the benefits of this

Structural Support Policy: Steps for Government
- Provide long term policy consistency for industry
- Ensure support schemes make it easy to take up new technologies and to export
- Ensure that infrastructure keeps pace with requirements
- Improve tax treatment of R&D and capital investment to encourage growth and investment
- Provide financial products & access to finance
- Maintain a strong ecosystem for engagement of companies in innovation (e.g. Catapults)
- Maintain effective SME support with development finance and export help
- Clear and, proportionate and accessible legislative framework
- Deliver advisory services for growing companies with respect to local environmental issues
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**Overcoming Barriers to Improving Manufacturing Productivity**

Our research with manufacturers shows how the individual elements of our productivity improvement framework can deliver real gains in practice. This framework can be applied across all parts of the manufacturing supply chain and in companies of all sizes, but we recognise that there will be barriers to overcome for some manufacturers in turning an appetite to raise productivity levels into reality.

Our work found that companies often lack the **information** on how to move their leadership to the next level, or need greater clarity on the benefits of adopting new practices. Similarly, **time** and **financial resources** can limit a firm's ability to effect change and make effective investment decisions.

Key success factors to help overcome barriers according to our framework, and that will apply to companies of all sizes and all sectors (with links to the most relevant case studies in brackets), include:

**Leadership & Ambition**
- Setting a clear and inclusive vision (CS1, CS3)
- Working with supply chain as well as own employees (CS2)
- Achieve change through people and culture (CS1)

**Skills, Culture & Employee Engagement**
- Developing top line leaders and coaching (CS11, CS13)
- Providing channels for employee input (CS10, CS12, CS14)
- Communicating company goals and alignment (CS1)

**Innovation & Technological Step Change**
- Investing in appropriate new technology (CS5, CS9)
- Adopting innovation for process efficiency (CS6, CS7, CS8)
- Finding the right partners to work with (CS4)

**Leadership & Ambition**

Managing the day to day challenges of manufacturing operations can often leave business leaders without the bandwidth to set out a clear plan for the future. Competing priorities and the lack of visibility of their customer’s future requirements can raise the hurdles on developing a clear vision for growth.
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Even for companies that are on a solid growth path, ensuring that the structure and the skills of the management team are keeping pace with business requirements is essential in maintaining focus and momentum on delivery.

Critically, some businesses struggle with ‘what good looks like’. Access to better benchmarking information will offer further confidence that managers are identifying the right priorities and setting the right goals.

**Skills, Culture & Employee Engagement**

Good employee engagement and a culture which strives for higher productivity and efficiency needs to start with the clarity of purpose from management. All levels of management need to be equipped with the skills to cascade these goals and translate them into actions for all segments of the workforce.

Through developing a culture of continuous improvement, staff at all levels (production staff, shop floor leaders and supervisors, production managers) can understand how to standardise production work, how to progress improvement by elimination of all forms of waste (maximising value added work and minimising non-value added work) from the bottom-up. Through relentless implementation of continuous improvement, management can eliminate unevenness and overburden in production work to maximise process efficiency.

The scope for business improvement can then come from any and all employees, provided the proper channels are in place for employee ideas to take root and have impact. Similarly this engagement can be supported by the appropriate reward and incentive structures. Getting this right can mean overcoming resistance to change.

**Innovation & Technological Step Change**

Investment in technology underpins process improvements and productivity gains, and increased innovation activity drives up the value of the customer proposition. However, balancing these decisions with limited resources can be a challenge for even the most tech-savvy companies. Support in balancing the risks and rewards of different investments and ensuring adequate resources are deployed on complementary investments (such as skills and software) can be vital for companies, especially those selling to diverse end-user markets. Accessing good partners for effective collaboration is something that SMEs can find difficult, especially in trying to secure the right outcome from their innovation activities.

With some smaller companies still reluctant to engage with the financial sector after the crisis, sorting through the appropriate financing options and having confidence in the provider and their advice is more important than ever. Readily available advice for SMEs from on the availability of grants and how to build consortia is important. For smaller companies in particular, successful innovation can rely on securing adequate financing with sufficient timetables for having new products accepted in the market.
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The advent of the fourth industrial revolution is likely to put some of the challenges on the radar of more businesses. Having the right strategy to guide investments in new technologies will become an even more important foundation.

Recommendations and Next Steps

Many of the barriers discussed in the previous section will be company specific and can only be addressed by leaders engaging with their customers and supply chains or through better utilisation of existing skills and capabilities within the firm.

We will continue to take an active role in this, and are committing to taking forward the following actions, building on what companies in this leadership group have already been doing. These are our pledges for ongoing action:

- Providing sectoral support for our supply chains to support continuous improvement;
- Showcasing what good looks like, such as through factory visits;
- Providing leadership on manufacturing networks to share best practice;
- Continuing to develop the content for the Productivity Framework;
- Acting as Productivity Champions to support this work and promote the fundamentals of productivity improvement; and
- Contributing to the products created by other Productivity Leadership Group workstreams, such as the Productivity Academy developed by the Better Workplace Practices group and the Resources Hub.

However, achieving substantial change across manufacturing requires actions from others too. There are some immediate steps that government (both national and local) and industry can take to encourage the implementation of best practice.

Actions for Government

Change and investment require confidence. Even in the current economic climate, which can hold back decisions on taking steps on the journey to productivity improvements, clarity about government priorities for the UK business environment can offer considerable stability and predictability. This applies not just to central government, but will be increasingly important as more responsibility for local economic growth is devolved to regions and cities.

Our specific recommended actions are:

Firstly, to improve this predictability, we support a very strong and clear Industrial Strategy that identifies sectors with a particularly strong focus for driving growth through better R&D, innovation and skills. This places these sectors as key growth engines and ones we develop for stronger inward investment and export performance.

Secondly, the importance of investing in technology and innovation to improve productivity should be a key priority for government support, as the benefits spillover to the economy more widely. We propose that Government develops a clear plan that doubles gross R&D investment in the UK within a decade (to at least 3% of GDP), supported by mechanisms such as the UK's
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Catapults and larger scale technology demonstrators that enable large and small companies to collaborate on productivity-enabling technologies, such as Industry 4.0.

Finally, we strongly support the recommendation of the Productivity Leadership Group to establish a Productivity Council, and believe that manufacturing should be a strong pillar within this. The key role of this body should be to ensure better coordination of support mechanisms that are available (including LEPs and sector councils) and ultimately to create a smaller number of stronger and more visible mechanisms and bodies to support SMEs in this area.

We would also expect Government to promote this new body and initiative. Having much more strategic activity, a longer-term focus, and a very strong brand in the UK will enable the UK economy to be more successful in attracting more investment and exporting more. This will also ensure:

- that the productivity framework and the recommendations in this report are deployed to the widest level within UK manufacturing that attracts engagement and enthusiasm;
- through this engagement, more best practice approaches get developed and rolled out further; and
- this becomes a sustainable initiative to drive a significant improvement in UK manufacturing productivity over the next decade.

Local Enterprise Partnerships have established Growth Hubs, which must be a gateway to locally-tailored business support programmes which can signpost companies of all sizes to the right support (such as on mentoring) and guide businesses through the availability of grants and other financing options.

**Actions for Industry**

Our key recommendations are for businesses to adopt the manufacturing productivity framework by taking forward actions that are relevant to them, to make use of the other tools and products developed by the Productivity Leadership Group (such as on measuring performance and the Productivity Academy), and to get involved with helping to deliver the ambitions of the proposed Productivity Council.

Our specific recommended actions are:

Firstly, we believe that industry should drive better leadership and stronger ambition in businesses. This includes establishing and participating in manufacturing best practice networks (such as the Manchester group profiled in the case studies), larger businesses taking stronger leadership on supporting their supply chains on productivity-enhancing initiatives, and working with education providers to make sure that curricula for manufacturing focus appropriately on leadership and productivity techniques.

Secondly, businesses must drive relentless continuous improvement through better employee engagement. In addition to developing continuous improvement skills, industry should also draw on the findings of the Better Workplace Practices workstream of the PLG in addition to identifying where learning from the manufacturing productivity framework could be applied in their facilities.
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Finally, companies should drive more investment in appropriate technology and innovation. The case studies connected to this report set out a number of ideas on productivity-enhancing technologies. Businesses will need to consider whether any of these are right for them as well as work with external networks (such as the UK's Catapults) to identify and take advantage of opportunities where technology and innovation can increase their manufacturing productivity. Companies should ensure that they are familiar with the support mechanisms available to support investments in technology and innovation.
## Appendix: Manufacturing Productivity Case Studies

This document contains a series of case studies provided by highly productive manufacturers with a significant UK presence, demonstrating how these companies have improved their productivity. We have divided these by the separate sections of the Manufacturing Productivity Framework.

<table>
<thead>
<tr>
<th>MPF Area</th>
<th>CS#</th>
<th>Company</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td><strong>Leadership &amp; Ambition</strong></td>
<td>1.</td>
<td>GlaxoSmithKline</td>
<td>30,000 global manufacturing and supply employees aligned around a single vision moves GlaxoSmithKline closer to ‘best in class’</td>
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<td></td>
<td>2.</td>
<td>Greater Manchester LEP</td>
<td>Greater Manchester Manufacturing Champions Network</td>
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<td></td>
<td>3.</td>
<td>Produmax</td>
<td>Sharing in Growth – To be engineering superheroes</td>
</tr>
<tr>
<td><strong>Innovation &amp; Technological Step Change</strong></td>
<td>4.</td>
<td>Rolls-Royce</td>
<td>Creating a Competitive Supply Chain using Manufacturing Technology</td>
</tr>
<tr>
<td></td>
<td>5.</td>
<td>Rolls-Royce</td>
<td>Making Manufacturing Competitive using Manufacturing Technology</td>
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<td></td>
<td>6.</td>
<td>Jaguar Land Rover</td>
<td>Automated gap &amp; flush inspection &amp; vision systems</td>
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<td></td>
<td>7.</td>
<td>Jaguar Land Rover</td>
<td>Installation of Automated Door and Bonnet Assembly Line</td>
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<td></td>
<td>8.</td>
<td>Siemens UK</td>
<td>Reduced Time To Market Through Agile Engineering Methods</td>
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<td></td>
<td>9.</td>
<td>Siemens UK</td>
<td>Collaborative and Flexible Automation for Complex Discrete Electronics Manufacturing</td>
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<tr>
<td><strong>Skills, culture and employee engagement</strong></td>
<td>10</td>
<td>GlaxoSmithKline</td>
<td>Involving production operators in equipment maintenance leads to 50% increase in line efficiency</td>
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<td></td>
<td>11</td>
<td>Rolls-Royce</td>
<td>Apprentice Academy - developing people capability</td>
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<td></td>
<td>12</td>
<td>Toyota</td>
<td>Expect process improvements can be identified and delivered by an empowered workforce</td>
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<td>13</td>
<td>Toyota</td>
<td>Working with suppliers to address process readiness difficulties</td>
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<td></td>
<td>14</td>
<td>Jaguar Land Rover</td>
<td>Team improvement circles</td>
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<td></td>
<td>15</td>
<td>Jaguar Land Rover</td>
<td>Glue path quality issues</td>
</tr>
<tr>
<td><strong>Structural Support Policy</strong></td>
<td>16</td>
<td>Perpetuum</td>
<td>Grant support accelerates innovation into global markets for SMEs</td>
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## Situation:
Significant shifts in the global healthcare market — driven by increased competition from generic manufacturers, pricing pressures from buyers, demand from emerging economies for access to medicines and fewer blockbuster drugs — have created an environment where lean, fast moving and more commercially-focused manufacturing and supply is critical for business success.

## Actions Taken:
Established a single worldwide vision to align all 30,000 employees manufacturing and supply employees: 
“To create a best-in-class, integrated supply chain that consistently delivers outstanding quality, service and value to our patients and consumers.”

The Vision was supported by 4 strategic themes to provide clear focus for improvement effort:

<table>
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<tr>
<th>Consistently deliver outstanding quality, service and value to our patients and consumers, through a best-in-class, integrated supply chain</th>
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<tr>
<td><strong>Invest in our winning team</strong></td>
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<td><strong>Deliver products of value at optimal cost</strong></td>
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<tr>
<td><strong>Work with zero accidents, defects and waste</strong></td>
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<tr>
<td><strong>Connect across GSK to drive performance</strong></td>
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Transformation programme launched to achieve the following:
- Creating strong employee connection with the products they make and supply and how these products help millions of patients and consumers “do more, feel better and live longer”
- Establish partnership with commercial colleagues to deliver a simplified product portfolio, optimise our inventory and working capital, improve forecasting and reduce costs
- Embed a new standard production system to drive a step change in accidents, defects and waste
- Generate world class global sourcing strategies, simplify our external supply chain and improve how we store, move product and buy from our logistics partners

Transformation programme work streams were driven by key resources drawn from across the business, complemented with external expertise, with direction from a strong leadership team. Employee engagement and understanding were key objectives for each workstream and programme plans for each workstream were built on the basis of one change management framework. Workstreams identified best practices and turned them into engaging learning content to improve capability across the organisation.

Ongoing engagement with a strong emphasis on listening drove a continuous ‘check and adjust’ process to ensure the workstreams deliver against objectives while keeping pace with changing business needs.

## Result:
Three years later, the GSK supply chain is more stable, more efficient and more robust. The programme delivered substantial benefits including 25% improvement in quality, 27% reduction in portfolio complexity, 35% improvement in safety performance and £650million in operational savings. The programme also introduced processes, tools and systems that give GSK the capability to become a best-in-class supply chain, when fully embedded, and to fully support GSK’s ambitious agenda for innovation, growth and competitive performance.

## Lessons Learned:
Maintain a strong connection between the transformation programme and the business to understand the operational pressures and ensure a strong check and adjust to keep the programme relevant due to the change in environment for a multiyear programme.
## Greater Manchester Manufacturing Champions Network

### Situation:
Based on evidence that the quality of leadership and management in Greater Manchester’s manufacturing SMEs was adversely impacting the growth potential of the sector, and hence the productivity of the UK, the Greater Manchester Manufacturing Strategy recommended the establishment of a business-led network of manufacturing champions as a positive response to promote the benefits of strong, growth-focused leadership across industry. Formed in late 2015 the program is already showing what a collective approach involving leading manufacturers can achieve, and has found its own needs led agenda as well as providing a platform to promote the role of these companies in supporting the growth of the manufacturing in Greater Manchester and its contribution to the Northern Powerhouse.

### Actions Taken:
Run by manufacturers, for manufacturers (but with the support of the regional growth hub) the Network targets ambitious leaders of small or medium sized manufacturing businesses in the region that employ over 20 people and have growth potential.

The specific objectives of the group are:
- Improvement of leadership and management skills in manufacturing companies.
- To promote best practice and the benefits of strong leadership to SMEs
- To help businesses embed progressive and continuous capability development
- To promote the successes of the manufacturing sector in Greater Manchester

The Manufacturing Champions running the program are:
- Articulating their experience on leadership and change management
- Sharing experience about staff development, planning and workforce motivation
- Communicate the benefits of measuring progress and performance
- Hosting of ‘best practice’ events in their company
- Organising appropriately structured academic input into discussions

### Result:
- Collective diagnostic activity to understand regionally the biggest challenges
- Individual diagnostic being undertaken by manufacturers using the tools at [http://howgoodsyourbusinessreally.co.uk](http://howgoodsyourbusinessreally.co.uk)
- Tackling Skills Shortages by taking manufacturers to see college / apprentice provision
- Tackling trust issues by mapping support mechanisms available regionally and nationally
- Peer to peer mentoring and coaching relationships being established
- Development work to develop change management skills

Within a relatively short period of time, progress is being made with manufacturers openly acknowledging their need to improve management and leadership capabilities to improve business performance. These managers are beginning to use a diagnostic process and are being encouraged to participate in management and leadership support programmes to tackle the issues identified. The network, although in its infancy, is confident that through supporting culture change and implementing Lean and business improvement tools successfully the productivity of those companies involved will improve.

### Lessons Learned:
Encouraging smaller manufacturing companies to become involved is challenging. They are busy, hardworking people and organisations who can be unused to this type of support offer and who have negative experiences making it difficult to know who to trust for help and support.

Creating the necessary environment is a culture change activity in its own right, requiring strong leadership, a public private partnership, and seed funding to enable start up activity.

In operation the reality is that the businesses willing to be involved only have so much time and the support / resource from the Growth Hub has been (and will continue to be) essential.
### Situation:
Produmax, a family-owned business based in Yorkshire, plans to improve turnover by over 40% by 2020.

The company manufactures and assembles flight control mechanisms primarily utilising CNC milling and turning technology for the highly competitive global aerospace market.

To win and deliver target growth profitably, the company is implementing a four year total business transformation supported by Sharing in Growth (SiG) and the Regional Growth Fund.

### Actions Taken:
The company's journey started with the development of a vision - to be engineering superheroes - as well as a mission, values and behaviours which involved their 50 strong workforce. From that SiG helped them create a strategy to increase the business turnover by 42% by 2020.

The strategy included moving from two plants into one new £3 million factory, doubling their floor space, increasing their efficiency and future proofing the layout and equipment in line with their growth ambitions. The company won £600K from the Regional Growth Fund towards the new plant and took advantage of 20% support for new equipment investment.

With SiG’s support, Produmax has created lean cells to improve efficiency and reduce waste, introduced a New Product Introduction process, developed their supply chain and created a visual, customer demand based production planning and control system. Their next step will be the development of lights out manufacturing using automation.

Training in team dynamics and cultural change, as well as lean coaching, have helped the leadership team engage the workforce in change, embrace lean, and created enthusiasm for development opportunities and making improvement suggestions.

Communication and productivity have benefited from the introduction of a Management Control and Reporting Structure as people are better able to respond to priorities and their actions are now fully aligned to the business plan.

### Result:
Since joining the SiG programme in July 2014 the company has secured £6.32 million in contracts. In one vital deal the company made a 50% reduction in cycle time in order to win a 10 year contract originally destined for manufacture in India and China.

Having gained a 40% improvement in Overall Equipment Efficiency and a £250K reduction in tooling spend, the company now has a 80% success in contract bidding, which compares with an industry norm of around 40-50%, and so is well on track to exceed its growth ambitions and increase its staff to around 70 including new apprentices (four per year).

### Lessons Learned:
A government-backed, industry-led transformation programme can pay dividends in supporting supply chain improvements.

Jeremy Ridyard, managing director: “Sharing in Growth is a truly inspirational programme that delivers growth at all levels.” Mandy Ridyard, finance director: “Sharing in Growth is a catalyst for action supported by a solid framework of experience, excellence and enthusiasm.”
## Situation:
Rolls-Royce’s vision is to be the market-leader in high performance power systems and to do this, a competitive supply chain is crucial. Throughout Rolls-Royce, advanced manufacturing technology and techniques are used to deliver lower-cost facilities and processes. One method Rolls-Royce uses to deliver new manufacturing solutions is through the network of Advanced Manufacturing Research Centres. The company is now looking to raise awareness of the network throughout its supply chain.

## Actions Taken:
Rolls-Royce is looking to provide a competitive lever to its external supply chain through the use of advanced technology and improve manufacturing performance. The Rolls-Royce approach is to connect strategic suppliers with the Advanced Manufacturing Research Centres network to allow them to take advantage of the most capable and cost effective manufacturing solutions for the products they deliver to Rolls-Royce.

The aim is that the connection becomes “self-sustaining” with the supplier taking the lead over time. Rolls-Royce will then develop joint roadmaps that ensure that solutions are on time and tailored based on demand. These include:

- Rolls-Royce launched an awareness programme at the 2014 Rolls-Royce Global Supplier Conference
- Global workshops were arranged and led by Rolls-Royce to showcase opportunities
- This led to 40 key suppliers engaged in follow up visits and projects
- A clear governance structure was developed leading to a clear supplier engagement plan focused on improving competitiveness.

## Result:
A major benefit of the Advanced Manufacturing Research Centres network is that it provides a platform for Rolls-Royce to engage with suppliers in a clear and structured manner.

Following the active plans by Rolls-Royce, 60 of its 93 strategic suppliers who deliver parts to its Aerospace businesses are engaged with the network. Many projects are being worked on which focus on a range of productivity drivers such as quality, process content and consumable usage and they are delivering results.

## Lessons Learned:
All this activity is captured in the Supplier Engagement Plans and now forms a key part of our dialogue on maintaining competitiveness.
5 Making Manufacturing Competitive using Manufacturing Technology

**Situation:**

Turbine discs and blades are at the heart of every engine that Rolls-Royce makes and the conditions in which they must operate are some of the most extreme to be found in modern-day power systems.

The Rolls-Royce disc facility in Sunderland was approximately 60 years old and productivity, cost and capability were all constrained by the prevailing methods and infrastructure.

The ultimate aim was to build a new facility in Washington, Tyne and Wear, which would contain new manufacturing processes and techniques that would provide Rolls-Royce with world leading capability and help deliver for our customers.

The target was a significant reduction in the number of machining operations for each disc, with a view to increasing production capacity and reducing costs in the new facility.

**Actions Taken:**

Rolls-Royce focused on delivering new technology and techniques to manufacture these discs through strong teamwork and shared expertise across Rolls-Royce, the Advanced Manufacturing Research Centres network and suppliers.

The company engaged with the very best engineering and manufacturing expertise across the UK to develop a shared vision of the future manufacturing processes, culture and environment. A High Performance Disc Manufacturing Plan was then developed which was focused on delivering a significant step change improvement in operational and functional performance. This plan included application of modern manufacturing systems, lean methods of manufacture, adaptive process controls and advanced machining and measurement systems.

**Phase 1:** The development of novel methods and technologies at the Advanced Manufacturing Research Centre and the selection of equipment and supplier partners.

**Phase 2:** Focused on proving rate capability and right first time capability. Work force training in new technology and the development and deployment of modern working practices.

**Phase 3:** Building the new UK Discs facility, in Washington Tyne and Wear and commencing production of fan and turbine discs.

**Result and Lessons Learned:**

The £100m UK Discs facility in Washington Tyne and Wear opened in June 2014. The new facility contains innovative manufacturing processes and equipment providing Rolls-Royce with world leading capability to manufacture 2,500 fan and turbine discs a year. This includes ground-breaking manufacturing techniques include the introduction of robotics and automation for shot peen, painting and chemical processing operations as well as latest advanced platforms for machining, grinding, broaching and inspection processes. The time it takes to manufacture a disc has been reduced by 50% while producing a step-change in component performance.
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<th>6</th>
<th>Quality Technology - Automated gap and flush inspection &amp; vision systems</th>
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<td><strong>Situation:</strong></td>
<td>In vehicle manufacturing, the current manual inspection process is a mainly visual inspection of panel gaps and flushness checks which makes it subjective and labour intensive. Because of time constraints, inspection is only performed on key specific items and improving accuracy of fit is mainly reliant on the post fit adjustment process. High levels of part complexity make it difficult to ensure the correct parts are fitted on each vehicle. JLR needed to create solutions which enable JLR vehicles to achieve World Class standards of closure fit and specification compliance, consistently, and to ensure that the correct parts are fitted to every vehicle – right first time.</td>
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| **Actions Taken:** | - Benchmarking against other premium competition indicated that other OEM's utilise more advanced, automated methods of maintaining consistent, high quality fits and part recognition.  
- Having identified which systems the other OEM's used, JLR contacted the suppliers, held meetings with them to discuss specification and applications and visited OEM's where the solutions were in place.  
- Advantages and disadvantages of each system and consideration of factory requirements was carried out to develop a JLR system specification and cost/benefit analysis which was used for project approval.  
- Following project approval by senior management, requests for quotation were released to the preferred suppliers and a review of available system technologies was carried out resulting a preferred supplier being chosen.  
- The first system was installed in August 2015 with results shown below. |
| **Result:** | The following results follow the installation of the first automated inspection system in August 2015:-  
- 100% measurement, including end of line buy off  
- 60 gap and flush and 36 part recognition measurements carried out per car in a 70 seconds cycle time  
- Automated detailed result and trend output  
- Live feedback to point of fit of closures enabling real time process changes  
- All data entered automatically in JLR Quality system  
- Warranty cost savings of approx. £65K/year so far.  
- Additional efficiency cost improvements of £80K/year so far  
- Significant improvements in product quality and Plant “first time through” |
<p>| <strong>Lessons Learned:</strong> | Following the successful implementation of this project, these automated inspection systems will be implemented as standard facility / process across all sites. |</p>
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<th>7</th>
<th>Installation of Automated Door and Bonnet Assembly Line</th>
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| **Situation:** | • Closure fit is a manual process with operators fitting doors, hood, tailgate, bonnet locking platform, and front fenders.  
• Current manual processes are unable to achieve fit tolerance (gap and flush checks) robustly and post fitting adjustment is necessary.  
• Benchmarking against other premium competition indicated that almost all other premium OEM's achieved tighter tolerances for closure flush and gap fitting than JLR.  
• JLR needed to create a solution which enables JLR vehicles to be achieving World Class standards of closure fit when compared to the three main German OEM's. |
| **Actions Taken:** | • Benchmarking against other premium competition indicated that compared to JLR, almost all other premium OEM used automated closure fit lines which led to more consistent placement of the closures and significantly less post fit adjustment.  
• Further technical investigations against a number of set criteria led to the identification of four suppliers who were able to provide facilities which achieved the revised specifications.  
• Having confirmed that all of the supplier's solutions could achieve the design specifications, the preferred supplier was identified following a “best total should cost” process and orders placed. |
| **Result:** | The following results are expected as a result of this project which will be implemented over the next two years:-  
• Body closure fitment within the required tolerance of ±0.5mm (with a standard process deviation of Cp of 1.67).  
• Enables a lower cost single fixing hinge to be implemented, which saves £5 per vehicle and 3kg in weight.  
• Improvement in efficiency/productivity of 2% when compared to previous manual process. |
| **Lessons Learned:** | • The prime purpose of this project was to understand how JLR could match and or exceed its competitors for World Class Body Quality.  
• Following the successful implementation of this project automated closure fitment will be implemented as a standard process. |
# Reduced Time To Market Through Agile Engineering Methods

**Situation:**
Traditional approach to product development, team structure and people development.
- Gap in Product Portfolio identified with immediate customer demand.
- Traditional product development approach resulting in a time to market between 18 & 24 months.
- Hierarchical project teams with clearly defined areas of responsibility.

**Actions Taken:**
Cross functional Agile team formed with complete ownership of product development cycle.
- Dedicated project team formed with full time representation from key disciplines.
- Team trained in Agile product development methods, empowered to make development decisions and co-located in a dedicated project room.
- Target of 12 month development time set.

**Result:**
G120C Framesize AA Product launched less than 12 months from project kick off. Rapid ramp up in customer demand.
- 6 weekly prototype delivery or “sprint” reviews increased learning through regular customer feedback.
- People gaining hybrid skills through exposure to all aspects of product development value chain.
- Released product is aligned to market needs and cost position resulting in high order intake.

**Lessons Learned:**
Productivity released through collaboration, empowerment and people gaining hybrid skills.
- Empowering our people increases ownership, team performance & wider business knowledge.
- A self-organising team increases skills acquisition & responds quicker to customer feedback.
- Agile methods and empowerment promotes a culture of ownership yielding further productivity.
How good is your business really?

### Collaborative and Flexible Automation for Complex Discrete Electronics Manufacturing

**Situation:**
Typical final product assembly at the Siemens Congleton manufacturing facility
- Business productivity driven and sustained by classical Lean methods over a 20 year period.
- Complex manufacturing assembly processes biased towards manual tasks.
- Limited exposure to robotic or flexible automation

**Actions Taken:**
Investment in Digital Tools and Virtual Reality to aid automation decision making.
- Understand the role, capability and opportunities of flexible and adaptable automation.
- Business Case developed for the automation of a mid-volume product assembly process.
- Engagement with automation SMEs and RTOs.

**Result:**
Collaborative robotics also provides flexibility and opportunity for enabling technology re-use
- Return on Investment (ROI) case based on the displacement of 2 full-time production operatives.
- Automation requirements now integrating into the R&D product development process.
- Advanced Manufacturing and Competency Development now part of Congleton's strategy.

**Lessons Learned:**
Siemens Congleton Robotic Learning Laboratory
- Flexible automation is becoming cost competitive and not limited to High Value Manufacturing.
- Product design for simplicity and/or automation should be cultural for effective manufacturing.
- Flexible automation is a key to enabler for both product customisation and future productivity.
How good is your business really?

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<th>Skills, Culture and Employee Engagement (GlaxoSmithKline)</th>
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<td><strong>Involving production operators in equipment maintenance leads to 50% increase in line efficiency</strong></td>
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**Situation:**
Low equipment efficiency and long maintenance activities created a bottle neck in the filling and packaging of fast growing consumer healthcare products at a GSK factory.

**Actions Taken:**
The site leadership team needed a new approach to deliver a sustainable improvement in line performance and satisfy growing demand for products from the site. Total Productive Maintenance (TPM) was chosen as a proven approach in a wide variety of manufacturing settings and it fitted well with the site’s priorities to deliver defect-free products, create a safe working environment and build a culture of ownership and performance.

As a first step, the site introduced Autonomous Maintenance, which is a way to restore a manufacturing line to the expected standard by putting in place the tasks required to prevent any deterioration from this standard. A key feature is that line operators are involved and ultimately responsible for simple maintenance activities that would otherwise have been performed by qualified technicians and mechanics. The site took a step-by-step approach to establish the initial standard, define the required tasks and build the capability and confidence of the production teams, starting with initial cleaning and inspection activities.

**Step 1: Initial Cleaning** - Teams of production, maintenance and engineering staff shut down and locked off the equipment and then performed an in-depth cleaning and inspection, looking for any signs of deterioration.

**Step 2: Remove Sources of Contamination and Inaccessible Areas** – To ensure the line doesn't deteriorate again, controls were put in place to prevent contamination which could lead to deterioration and accessibility of the equipment was improved to make cleaning and maintenance easier. The teams where challenged to think creatively and look for the root causes of contamination, controlling them at source.

**Step 3: Establish Provisional Cleaning, Inspection and Lubrication Standards** - Apart from the condition of the equipment, these standards are the most visible evidence of AM. Starting from current documentation, the team followed the lubrication and inspection schedule, noting any problems with accessibility, lubrication flow etc and developed their own standard, indicating items to be cleaned, checked or lubricated, the methods to be used and frequency and responsibilities.

Together these three steps delivered a restored and improved piece of equipment with a visually managed standard for cleaning, inspection and lubrication, and a production team with more ownership for the performance and maintenance of their equipment, and the skills needed to manage it.

**Result:**
Significant improvements were achieved and sustained, across a number of metrics recorded between 2010 and 2015:
- Increased time between operational failures on the line from 3 hours to 9 hours
- Reduced time taken to repair the line from 44 minutes to 35 minutes
- Reduced maintenance time from 8 hours to 4 hours per week
- Increased overall equipment effectiveness from 40% to 58%

**Lessons Learned:**
Building the capability of line operators and engaging them in roles previously undertaken by qualified engineering staff gave employees greater job satisfaction and ownership of performance, as well as improving workload balance, and increasing the distribution of knowledge within the organisation. The site improved safety and productivity as a result.

Building greater ownership and accountability among the production staff also enabled qualified maintenance teams to focus on more technically demanding activities and proactive improvements, as well as freeing them to respond more rapidly to line breakdowns. So the outcome had broader benefits for the site, as well as increasing job satisfaction for the qualified maintenance teams as well.

Autonomous Maintenance requires some resources. As a rule, issues raised in the initial phase should be addressed early, within eight weeks or so. So it makes sense to resolve issues with one machine at a time, rather than trying to implement AM across multiple lines at the same time.
Apprentice Academy – Developing People Capability

**Situation:**
Rolls-Royce, makes significant use of the UK Engineering supply chain across all five business units; Civil Aerospace, Defence Aerospace, Power Systems, Nuclear and Marine. However the UK’s aerospace, engineering and manufacturing sectors face a challenging future. Globalisation, an ageing workforce and skills shortages present a real test to the growth and maintenance of British businesses’ competitiveness.

**Actions Taken:**
Rolls-Royce has established the Manufacturing Skills Partnership to help organisations across these vital sectors build more resilient and powerful workforces that are equipped with the necessary skills for a strong, healthy future.

Through the Manufacturing Skills Partnership, Rolls-Royce helps suppliers by:
- **Building strong talent pipelines.** Rolls-Royce helps suppliers develop the capability to host structured work experience placements for school pupils and young apprentices, as well as offer internships to promising undergraduates.
- **Creating customised apprenticeships.** Rolls-Royce works with suppliers in the UK to attract talented people. This includes using Rolls-Royce support and expertise for the recruitment and assessment process. The company also helps customise the apprenticeship programme so apprentices develop the exact skills the supplier needs.
- **Developing “Skills Escalators” for existing staff.** Rolls-Royce trains suppliers on how to create flexible continuous professional development programmes that meets the needs of their existing employees, the company and its customers. This includes support, guidance and training for employees who would like to become coaches or mentors themselves. This approach helps retain talented staff and develop our supplier’s future capabilities.
- **Help plan for the future.** Rolls-Royce supports suppliers and manufacturing businesses in planning and managing their future skills development. By working in collaboration with employers and other experts, Rolls-Royce shares knowledge and experience, helping companies create internal and external development frameworks. Together, these can help to sustain a company’s competitive edge in an ever-changing world.

**Result and Lessons Learned:**
To date the Manufacturing Skills Partnership has:
- Trained 130 Apprentices on behalf of our supply chain
- Supported 35 work experience placements
- Funded and helped provide 150 Continued Professional Development opportunities
- Provided 70 mentors for Rolls-Royce supply chain and SME companies across the UK
**Expect process improvements can be identified and delivered by an empowered workforce**

**Situation:**
Kaizen is at the heart of our Toyota Production System (TPS). Kaizen is a process of ‘continuous improvement’ which helps to ensure maximum quality, to eliminate waste and improve efficiency. Each member is encouraged to “always look for a better way” to carry out the process they perform. This can be on the shop floor or in the office.

Kaizen, however, can only truly be measured if the process you are improving has a standard. As Standardised Work involves following procedures consistently and is the foundation of the TPS house, we always start with studying the current situation.

The philosophy of Toyota, outlined in the “Toyota Way,” is to “improve our business operations continuously, always driving for innovation and evolution”. By involving all members in this thinking way, it empowers the “expert” in the process to consider “is this the best way to do my job?”

**Actions Taken:**
Sealer Process line 1:
Problem identified – Excessive walking to and from a static line side table.
The task - To eliminate/reduce the amount of walks to the table.
Activity – The Team Member has designed and developed a table to follow the car body on the conveyor. This enables the production team member to always have his tools close by him and also eliminates his return walks to the table, therefore saving him time on his process (2 seconds/vehicle).

Once the Kaizen had been trialled and proven both shifts Supervisors agree the change and the new standard will be set.
This behaviour is embedded as a core job role and expectation. Kaizen generation is measured for each Production operative as part of their performance appraisal to ensure a kaizen mind is sustained.

**Result & Lessons Learned:**
Selecting cost effective workable examples, no matter how big or small, allows us to rebalance and redeploy members within our business, enabling us to fulfil our goal of always improving our business operations.

More radical kaizen activities, (Jishuken), are undertaken when large scale improvements are required. These involve multi skilled teams intensively interrogating the processes of a line or section to identify potential big gains in efficiency. Removing the waste from our processes realises true efficiencies, reducing costs per vehicle built.

Kaizen awards, presented by Senior Management, recognise member contribution and encourage members to always look for a better way; this philosophy is embedded within our workforce from day one and helps to deliver an engaged and empowered workforce.
### Working with suppliers to address process readiness difficulties

**Situation:**
A “New” Toyota UK tier one supplier of interior trim had successfully tendered for our business - increasing their Production & Logistics operations significantly (138 new part numbers and an increase in deliveries from 2 trucks per day to 12). Pre-production trials showed this supplier’s management had underestimated the size of the task and they were at serious risk of impacting TMUK Dual Model Start Of Production.

**Actions Taken:**
To support this new supplier we looked at 3 critical areas
1. Potential project schedule delays (tooling trials, process readiness, member training)
2. Management structure and understanding of situation (quantity and capability of managers & staff)
3. Current mass production condition for existing customer + new business (Safety, Quality, OEE, production planning, tool maintenance, logistics control)

Together with the supplier, we created an improvement plan and a joint organisation with clear roles, responsibilities, actions and targets to address these issues. Leaders were allocated to each activity and an action centre was established where progress was followed daily by senior management from the supplier and Toyota.

To ensure the supplier would be successful we allocated 12 Toyota members on-site for 10 weeks - the key was coaching the supplier’s members through our methodology. This allows the suppliers organisation to develop and “grow” utilising Toyota members knowledge and skill as support.

**Systems development/confirmation:**
1/ All manufacturing areas target cycle times calculated based on Takt time and ensured standardised work instructions could be achieved by training members.
2/ Manning levels calculated and member hire / training supported.
3/ Production KPIs established to monitor/improve OEE and Quality, identifying gaps to target and then one by one problem solving.
4/ A quality “firewall” was set up confirming 100% parts quality until stability of process was established
5/ Logistics area improved to ensure min/max stock levels clear to prevent shortages for truck preparation. Required floor space confirmed, member standardised work introduced.

**Result & Lessons Learned:**
From a practical point of view the supplier was successful and achieved the goals set by the joint Management team (see below).
- Achieved 4 days safety stock of all part numbers.
- Zero short shipments to TMUK during SOP period
- No critical quality defects leaked to TMUK
- OEE increased from approx. 40% up to 78% overall.
- Defects reduced from 20% to 1% in house and to 25PPM at TMUK
- Management team understands how to manage gaps to target effectively.

More importantly however, was the development in the people. Collaboration between both customer and supplier are key to successful business relationships and ensure both parties grow and prosper. Toyota have adopted and developed this principle over many years and are established and explained as the “Toyota Way”.

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How good is your business really?

## Team improvement circles

### Situation:
- In order to maintain a sustainable business, JLR needs to improve its quality standard and material and operating cost performance.
- There are several initiatives across JLR which are doing both but few of the activities engage directly with the workforce.
- The task was therefore to create an improvement process which engages directly with the workforce, allowing them to generate and implement quality improvement and cost reduction ideas.

### Actions Taken:
- Following benchmarking of other OEM's processes and trial activities run with select groups of associates; in the summer of 2015, a new Jaguar Land Rover voluntary employee engagement programme called Team Improvement Circles (TIC) was launched.
- Based around the concept of Quality Circles, a team of up to six employees, ideally from the same work area, work together over a number of months to find and implement a solution for a work based improvement idea.
- Each of the teams are given basic problem solving training and follow a defined ten step process.
- The teams enter their idea into local conventions and if approved, they present their ideas at the annual JLR TIC Regional Convention and have their themes evaluated by the JLR Senior Management Team. The evaluation is judged on the overall journey of employee engagement. However, as a by-product, post event the business impact of each theme is additionally assessed against specific Business driver criteria e.g. Quality & Cost improvement.
- The winners of the regional final go forward to compete in the JLR UK Final, the first of which was held in April 2016.

### Result and Lessons Learned:
- 43 teams entered their local conventions, each team presenting 1 idea which had already been implemented.
- Following the local conventions, 32 teams were selected to go through to the regional convention with an estimated saving of £5.3M p.a. across the teams.
- This year, the winning UK team will spend a week in the JLR China plant teaching their Chinese colleagues the TIC process and experiencing JLR's latest new factory.
- In 2017 JLR will hold a Global TIC final which includes ideas from Brazil, India and China as well as the UK.
## Glue path quality issues

**Situation:**
- JLR aluminium bodies are held together with a combination of self-piercing rivets and structural adhesive.
- All of the rivets are applied with automation due to the size of the equipment required but due to product design, only 95% of the structural adhesive can be applied by automation, the remainder being applied manually.
- Some associates have issues producing consistent glue application (path and quantity of glue applied) which leads to panels being reworked or scrapped.
- Panel glue path issues can also be difficult to detect within process time which leads to down time and quality concerns that require Paint shop repairs.
- JLR wanted to improve the current manual process, reduce the number of process failures and scrap components, and to identify an ‘in line’ method that promotes quick identification of glue path issues.

**Actions Taken:**
- Carried out an Ishikawa (fish bone) analysis on the process to identify the root cause of the issues.
- Key root cause was identified as associates not being able to reference a visual or physical standard whilst applying the structural adhesive.
- Created a new process, supported by visual and physical aids that associates can quickly reference to ensure consistency.
- Conducted trials and training to new process to benefit changes to the associates.

**Result and Lessons Learned:**
- Following the introduction of the new process in January 2016 there has been a significant reduction in errors and the speed of identification has increased leading to fewer issues getting through to the paint shop.
- Annual savings are estimated around £6000 p.a.
- JLR has started to cascade this process across all of its manual sealing and structural adhesive applications.
## How good is your business really?

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<th><strong>Grant support accelerates innovation into global markets for SMEs</strong></th>
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### Situation:
Rail has not adopted modern technology as fast as other transport sectors and has been using limited monitoring equipment supplemented by human listening and feeling skills to detect failing bearings and degraded track. The Rail Industry needed an easy to fit low cost monitoring system that would give early warning of failing bearings, damaged wheels and deteriorating track to enable maintenance to be focussed effectively. Perpetuum developed innovative wireless systems powered by energy harvesters to provide a very effective low cost system to reduce maintenance costs and enhance safety for rolling stock and track.

### Actions Taken:
As an SME with world leading new enabling technology, Perpetuum needed assistance to accelerate development, get the product to market quickly worldwide and retain technical leadership. The scale of the opportunity is massive but Perpetuum's resources were limited with the normal constraints of a small but fast growing business.

In addition to further funding from investors, Perpetuum sought a series of grants to make possible parallel investments in a family of product developments. Money was also needed to fund the pilot installations in the market and working capital for larger orders.

Grants from the Department of Business, Innovation and Skills (BIS) through InnovateUK, from Future-Railway and from the EU FP7 programme and the new H2020 SME Instrument programme have provided the necessary funds to develop the systems far more quickly than would have been possible just with cash generated from organic sales growth.

Other support from EU market entry coaching and UKTI export exhibition and marketing support programmes have all provided valuable help for a small company to exploit rapidly the opportunities created by its innovative technology in export markets.

Perpetuum has achieved rapid growth with a corresponding major increase in highly skill UK employment.

### Result:
The result is that Energy Harvesting powered wireless systems are being fitted in minutes to train bearing housings worldwide with installations in several European countries, USA and Australia. The data is transmitted wirelessly and analysed to provide live monitoring and warnings over the internet for bearings, wheels and track, enabling step change improvements in maintenance costs and productivity as well as enhancing train safety and service reliability. Perpetuum is a UK owned and based business using structural support to contribute to rapid economic growth.

### Lessons Learned:
Structural support in the form of grants for financing innovation and support for exporting are particularly important to help SMEs create growth and improve productivity.