OPERATIONAL EXCELLENCE.

ACHIEVE OPTIMUM QUALITY AND EFFECTIVENESS IN YOUR PRODUCTS AND PROCESSES.
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OPERATIONAL EXCELLENCE.

OPERATIONAL EXCELLENCE OCCURS WHEN ALL PARTS, PROCESSES AND PEOPLE IN AN ORGANISATION ARE WORKING AT THEIR OPTIMAL LEVEL TO MEET CUSTOMER REQUIREMENTS MORE EFFECTIVELY THAN THEIR COMPETITORS.

It requires drive, focus and understanding at all levels, and takes time to establish. Achieving Operational Excellence can substantially decrease monetary loss due to poor performance, defects and other output related issues. By creating a streamlined and near-flawless system, managers can also focus more of their precious time on bigger, more complex problems and projects, rather than putting out metaphorical fires caused by output miscalculations and supply vs. demand discrepancies.

Organisations working to achieve Operational Excellence must focus on the Efficiency and Effectiveness of their operation or a combination of the two.

EFFICIENCY:
Efficiency in Operational Excellence is based on delivering outputs with short lead times and at the lowest possible cost (without hindering quality). Organisations desiring efficiency should aim to drive response times, lead times and costs down while simultaneously driving overall capacity and workforce engagement up. This is the primary driver of Lean.

EFFECTIVENESS:
Effectiveness in Operational Excellence is intended to create consistent high quality products and services. Organisations desiring effectiveness should aim to drive defects, variation and output failures down by maintaining control of a process, and simultaneously increasing the overall quality of outputs. This is the primary driver of Six Sigma.
OPERATIONAL EXCELLENCE

THERE ARE A VARIETY OF TOOL SETS THAT CAN ASSIST IN ACHIEVING THE HOLISTIC APPROACH TO OPERATIONAL EXCELLENCE.

A proven capability for defining and solving engineering, IT and management problems, generating new ideas and evolving technical systems. It enables users to uncover the most effective routes to practical engineering solutions, as well as the development of next-generation products.

Every organisation is at a different stage in their journey to Operational Excellence, and the Institution of Mechanical Engineers is here to support at every stage. Whether you are looking for an introduction to some concepts that may help, or in depth training on specific tools; from a single day open course to a tailored in-house programme over several months, we can help you and your organisation develop.

Contact our training team on +44 (0)207 304 6907 or email training@imeche.org to create your personalised programme today.
LEAN AND SIX SIGMA – WHAT’S THE DIFFERENCE?

LEAN AND SIX SIGMA HAVE BOTH BEEN DEVELOPED OVER MANY YEARS, AND ARE IMPLEMENTED ACROSS A WIDE RANGE OF INDUSTRIES.

From oil and gas industries to high-tech manufacturing; from medical services to financial services; and in all functions from operations to customer service and admin. They are proven methodologies and show high level returns when implemented correctly.

A philosophy designed to focus on customer value and elimination of waste.

Lean projects follow a process to analyse different parts of the supply chain and identify areas where unnecessary steps can be removed or wasteful behaviours can be reduced. This streamlines the process without impacting quality, providing a valuable and reliable product/service to customers and other businesses.

A statistically rigorous problem solving discipline.

Six Sigma is statistically powered. It identifies variation within the supply chain to decrease the number of defective outputs, creates a more reliable product and statistically calculates how the improvements can be made.

They each have a different focus and approach, and although they can be used in conjunction with each other, it is important to understand the differences in order to choose the most appropriate intervention for your organisational requirements.

Interested in learning more? Access our free webinar ‘Lean and Six Sigma: What’s the difference, and why it matters’.

Create your free account at lms.imeche.org.
THE BREAKDOWN: LEAN.

IF AN ORGANISATION OR DEPARTMENT WANTS TO IMPROVE CUSTOMER RESPONSIVENESS, INCREASE CAPACITY, INCREASE WORKFORCE ENGAGEMENT AND MOTIVATION, REDUCE LEAD TIME OR REDUCE COSTS, LEAN IS AN EXCELLENT APPROACH TO START WITH.

Although some elements of Lean have been identified as far back as the 15th Century, and much later with the Model T Ford production line, modern Lean is credited to Toyota, who developed the Toyota Production System after the Second World War.

This was documented by James P. Womack, Daniel Roos, and Daniel T. Jones in their book The Machine That Changed the World (1990); and has since been adapted and adopted across the world. It is a philosophy and approach aimed to understand customer value and ensure all processes in an organisation focus on providing this value with zero waste. This takes dedication and a long-term approach, but can be implemented in a modular manner with very quick results.

DID YOU KNOW?

During a visit to America, Vice-President of Toyota, Taiichi Ohno, was impressed by the supermarkets. He noted that:

1. Usually there is a standard amount of each item on the shelves
2. People buy what they need, when they need it and stock is replenished to replace only what has been sold
3. There is a card to indicate when stock needs to be re-ordered
4. Distributors bring new goods according to what has been sold
5. There is no space to overstock goods
6. Many items in the supermarket are perishable

These observations were the inspiration for Ohno to develop the JIT (Just In Time) system at Toyota (the Toyota Production System).

This has since been further developed and used in Toyota, and subsequently all industries, under the name ‘Lean.’
THE 5 PRINCIPLES OF LEAN

Lean is a philosophy designed to increase responsiveness and customer service by only providing what the customer values at the time they want it and in the quantity they want it.

Therefore organisations need to be able to:

1. Specify what creates value from the customer’s perspective
2. Make those actions that create value flow
3. Identify all steps across the whole value stream
4. Only make what is pulled by the customer, just-in-time
5. Strive for perfection by continually removing successive layers of waste

This is done by focussing on the identification and elimination of waste from all steps of the process, and can be assisted by the methodical application of appropriate tools. Lean tools and techniques can often be shared amongst the wider organisation through practical improvement exercises.

Each Lean tool is somewhat better suited to a different situation, but can all be adapted to be suitable at any stage of the process. Having a deeper understanding of the tools allows users to make the impact of them significantly greater, by applying them in the most effective way for the unique situation.

The tools that people see and associate with Lean are all methods of identifying value, eliminating waste and embedding a new way of working into an organisation.

THESE TOOLS CAN BE IDENTIFIED AS:

Tools
- Process Mapping
- Voice of the customer
- Understand demand
- Takt time
- Cycle Time and Line Balancing

Tools
- Pull systems (Kanban)
- One piece flow
- Mixed Model Scheduling
- SMED

Tools
- Waste Analysis
- 5S (Workplace organisation)
- Performance Management
- Standard Operating Procedures
- TPM
These tools can complement each other within a Lean roll out programme. Lean programmes aim to bring the principles of Lean to an entire organisation, focusing on the customer and having value flowing across departments.

Roll out programmes are more prescribed than projects and are generally based on a Lean Temple.

THE LEAN TEMPLE

CONTINUOUS
IMPROVEMENT

PEOPLE

Ownership
Involvement
Empowerment
Waste reduction

FLOW

Takt time
One-piece flow
Pull systems (Kanban)
SMED
OEE

QUALITY

Six Sigma (including Voice of the Customer)
Process Control
Process Capability
Poka-Yoke (Mistake proofing)
In-station quality control

FUNDAMENTALS

(ATTITUDE, STANDARDISED WORK, VISUAL MANAGEMENT, 5S)
THE BENEFITS OF GOING LEAN CAN BE EXPERIENCED AT MULTIPLE LEVELS WITHIN AN ORGANISATION. BY USING EFFECTIVE LEAN PRINCIPLES, MANAGERS CAN DEVELOP A MORE SUCCESSFUL AND MOTIVATED TEAM, FLOWING ON TO THE ORGANISATION AS A WHOLE, AS DESCRIBED BELOW.

**For managers**
- Easier to manage the flow of work
- Less fire-fighting and more time to manage properly
- Problems are instantly visible and can be dealt with appropriately

**For teams**
- More involvement and hence better morale and productivity
- Work is streamlined and more motivating
- Feel part of a bigger value stream, focusing on customers

**For organisations**
- Can respond to customers faster
- Can be more flexible with different customer requirements
- Better communication between departments
- Less duplication of effort
- Continuous Improvement

As an organisation, do you need to:
- Look at your processes differently?
- Think solely of what your customers actually want?
- Identify who your customers are?
- Remove waste from your processes?

If so, then a Lean programme may prove beneficial.

Creating a complete programme to improve your organisation’s performance and profitability incorporates the engagement and involvement of the workforce at all levels.

Tell us your team’s CPD needs and we’ll come to you with a specialised training programme, customised for your industry sector.

For guidance on which course would suit your requirements call our experienced training advisors on +44 (0)207 304 6907 or email training@imeche.org.
IN ORDER TO DEVELOP LEAN CAPABILITIES OVER TIME, THERE ARE THREE PROGRESSIVE COURSES; INTRODUCTION TO LEAN, LEAN PRACTITIONER AND LEAN LEADER.

These courses can be taken independently or implemented as a professional development programme. Each level incrementally increases in terms of complexity, equipping delegates with the ability to oversee larger projects and bigger teams. With this experience, will also come a greater understanding of how to apply Lean tools to different businesses and problems, to create a far more streamlined and stable production line.

LEAN COURSES AND DEVELOPMENT STAGES:

1 DAY INTRODUCTION TO LEAN

This course is designed as a basic introduction to some of the concepts of Lean, as a basis for a Lean roll out in an organisation or department. It provides a foundation for further development in Lean and is also a step in moving forward with a Lean Six Sigma learning journey, to design and improve products and processes to world-class standards.

Delegates will develop their understanding of the core Lean principles, giving them confidence to identify opportunities for Lean improvement back in the workplace.

3 DAYS LEAN PRACTITIONER

As a follow on from the Introduction to Lean, this course is designed for delegates wishing to get a practical overview of Lean and the basic Lean tools designed to help teams get started with their Lean journey. It is highly practical and delegates are encouraged to bring real-life problems with them and to use their own processes during practical exercises wherever possible.

Delegates will develop their understanding of the principles of Lean thinking through the practical application and understanding of a number of Lean tools in a low-risk environment.

1 DAY LEAN LEADER

This course is designed for delegates wishing to get a practical overview of how to implement Lean within their organisation. The knowledge obtained in Introduction and Practitioner will allow delegates to reach a higher level of understanding and capabilities, to lead projects and project teams.

The principles of Lean are recognised all over the world as the most powerful and effective way to build and sustain continuously improving businesses. Lean is a philosophy and a proven long-term approach that aligns everything in the business to the delivery of increased customer value. Lean focuses on orientating people and systems to deliver a continuous stream of value to the customer and eliminating waste and deficiencies in the process.

The concepts sound straightforward, but what do you actually need to do in order to develop a Lean Organisation?

Delegates will develop their understanding of the foundations of Lean transformation, the importance of creating a strong Lean culture and how to lead and develop the culture to ensure sustainable improvement and growth.

You can save on multiple bookings – use our Learning Pass option when booking several training courses for yourself or your team and make savings of up to 33% off the full price.

Call our experienced training advisors to get more information and discuss your training needs on +44 (0)207 304 6907 or email training@imeche.org.
THE BREAKDOWN: SIX SIGMA

IF A DEPARTMENT OR ORGANISATION WANTS TO HAVE MORE CONTROL, IMPROVE CONSISTENCY, REDUCE VARIATION, OR IMPROVE QUALITY OF A PROCESS, PRODUCT OR SERVICE, SIX SIGMA IS OFTEN THE APPROACH SELECTED TO START WITH. SIX SIGMA TOOLS AND TECHNIQUES REQUIRE MORE FORMAL TRAINING THAN LEAN.

Six Sigma was developed by Motorola as a robust, data driven problem solving discipline. It is designed to reduce variation, and to strive for perfection in a process:

- The target is defined by the customer
- Perfection is defined statistically

DID YOU KNOW?

Six Sigma was introduced by engineer Bill Smith while working at Motorola in 1986. In 2005 Motorola attributed over US$17 billion in savings to Six Sigma.

Jack Welch made it central to his business strategy at General Electric in 1995 and other early adopters include Honeywell (previously known as AlliedSignal).

By the late 1990s, about two-thirds of the Fortune 500 organisations had begun Six Sigma initiatives with the aim of reducing costs and improving quality.

- Reduce variation in order to control, improve and then manage a process

There is a strong emphasis in Six Sigma on working with data and using statistical tools to identify the key areas to improve.

THESE IMPROVEMENTS ARE MADE USING THE DMAIC CYCLE.

The DMAIC cycle supports the Six Sigma approach. At each stage of Six Sigma progression, the use of DMAIC will vary, but the overall purpose remains constant (from Yellow Belt through to Master Black Belt).

Measure the current situation

Define the problem clearly

Analyse why the issue is happening

Implement a solution

Control the new process and monitor the changes

Our courses support Continuing Professional Development - our training helps engineers meet the standards required of professionals registered with the Engineering Council.

For advice on which course would suit your CPD requirements call our training advisors on +44 (0)207 304 6907 or email training@imeche.org
SIX SIGMA DEVELOPMENT CONSISTS OF 4 BELTS, WITH EACH BELT ENCOMPASSING A LEVEL OF SKILL AND EXPERTISE NEEDED TO EXECUTE THE NECESSARY TOOLS AND TECHNIQUES REQUIRED ACROSS A VARIETY OF PROJECTS.

An introduction to Six Sigma is also recommended as an initial overview to the philosophies and a taster of the basic tools before team members undertake further development.

Below is an example of the Six Sigma belt progression. It outlines the skills, techniques and tools associated with each stage. The development stages are mapped out on the following page to give you an understanding of the delivery format, content, certification, software and who should attend.

- High-level seniority which assists in removing road blocks
- Although not a belt, Champion is an important support role
- Requires full time commitment to Six Sigma
- Responsible for company vision, mission, goals and metrics at all stages of the process

- Technical Expert
- Understands mathematical theory on which statistical methods are based
- Able to understand and react to particularly complex or obscure situations and lead Six Sigma project teams through them

- Leads and directs Six Sigma project teams
- Spends 100% of time on Six Sigma related projects
- Expert in advanced tools for complex problems
- Has ability to train Green Belt
- Has acquired 20+ days Black Belt training
- There will usually be 1 Black Belt amongst a team of 100 personnel

- May lead an improvement team, or be on a Black Belt project
- Works part time on projects (20%+)
- Has acquired training in basic Six Sigma tools and techniques
- There will usually be 1 Green Belt amongst a team of 20 personnel

- There will usually be multiple team members with Yellow Belt that provide individual subject matter expertise dependent on their industry and department
- Has acquired basic understanding of Six Sigma
SIX SIGMA DEVELOPMENT STAGES

1. YELLOW BELT
   - Delivery format:
     - 2 or 3 workshop days
     - Work based project
     - 4+ coaching days based on a team of 12
     - 1 assessment day
     - Project presentations to senior sponsors
   - Core Content:
     - The principles of Six Sigma
     - The DMAIC process
     - Tools and techniques needed to analyse a value chain and challenge and improve the status quo
     - The concepts needed to make change stick
     - Introduction to the Six Sigma Tool Set including 7 Quality Tools
   - Certification:
     Delegates will need to attend all of the training days and then successfully complete a work based project with an aim of typically saving £10k per year.
   - Software:
     Delegates will need access to MS Excel.
   - Who should attend?
     The Yellow Belt programme is ideal for those involved in solving technical and challenging problems especially as part of a team. This could include team members, operators and others.

2. GREEN BELT
   - Delivery format:
     - 10 workshop days (delivered in blocks of learning)
     - Work based project
     - 6+ coaching days based on a team of 12
     - 1 assessment day
     - Project presentations to senior sponsors
   - Core Content:
     - Yellow Belt content plus
     - Building on the Six Sigma Tool Set (e.g. hypothesis testing, regression and DoE)
     - Managing people through change
   - Certification:
     Delegates will need to attend all of the training days and then successfully complete a work based project with an aim of typically saving £25k per year.
   - Software:
     Delegates will need access to MS Excel, and the "data analysis tool pack add in".
   - Who should attend?
     The Green Belt programme is ideal for those individuals who need to solve technical and challenging problems as part of their daily duties. This could include team leaders, senior operators, departmental managers and senior managers.

3. BLACK BELT
   - Delivery format:
     - 20 workshop days (ideally delivered in 4 x 5 day blocks, or 5 x 4 day blocks of learning in line with operational requirements)
     - Work based project
     - 8+ coaching days based on a team of 8
     - 2 assessment days
     - Project presentations to senior sponsors
   - Core Content:
     - Green Belt content plus
     - The big picture view of Six Sigma within the organisation
     - The advanced techniques of Six Sigma
     - The power of software to simulate processes and improvement opportunities
     - The tools to maintain improvements
   - Certification:
     Delegates will need to attend all of the training days. Certification is through demonstrating a significant impact for the host business, with an aim of £100k+ saving per year.
   - Software:
     Delegates will need access to Minitab, version 15 or higher.
   - Who should attend?
     The Black Belt programme is ideal for those individuals who are employed primarily to drive business improvement projects and deliver major change within an organisation. This could be heads of business improvement, continuous improvement engineers and internal change consultants.

Contact our training team for more information on training@imeche.org.

The Master Black Belt and Champion programmes are available on demand.
TRIZ - THEORY OF INVENTIVE PROBLEM SOLVING
(TEORIYA RESHENIYA IZOBRETYATELSKIKH ZADATCHEK)

TRIZ STANDS STRONGLY AS A POWERFUL TOOL IN ITS OWN RIGHT THAT CAN BE USED TO SUPPORT INNOVATION (I.E. THE ACHIEVEMENT OF A COMMERCIAL SUCCESSFUL STEP CHANGE ADVANCE).

All systems hit limits. And every attempt to reduce variation or eliminate waste is sooner or later thwarted by something: we reduce waste at the expense of speed, for example, or we increase manufacturing precision at the expense of durability. Whenever we encounter such contradictions, we need TRIZ if we’re to move forward.

TRIZ represents the output of a study of over 70 years of research and 9 million cases in which problem solvers and system architects had encountered such limits and successfully made a contradiction-resolving jump to a better solution. TRIZ is a toolkit that encourages the user to run towards conflicts, trade-offs and paradoxes, conundrums and chicken-and-egg situations in order to accelerate the rate of improvement of systems. Best of all, the contradiction-solving basics of TRIZ can be learned in a day, and be incorporated into all forms of the DMAIC process thus enabling Operational Excellence teams to be seamlessly integrated without disruption to the established order.
## TRIZ DEVELOPMENT PATHS

The table below shows the development paths that have been created by the IMechE to support the embedding of TRIZ to meet the different needs within an organisation.

<table>
<thead>
<tr>
<th>Course</th>
<th>Duration</th>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21st Century TRIZ Day 1</td>
<td>1 Day</td>
<td>Introduction</td>
<td>‘An introduction to the concept and the most used tools’</td>
</tr>
<tr>
<td>21st Century TRIZ Day 2</td>
<td>1 Day</td>
<td>Appreciation and Application</td>
<td>‘Bring a classic-problem that you are confronted with and let’s work through it’</td>
</tr>
<tr>
<td>21st Century TRIZ Days 3 and 4</td>
<td>2 Days</td>
<td>Practitioner</td>
<td>‘Let’s get very specific with a group of 10 who bring with them real projects to work on’</td>
</tr>
<tr>
<td>Masters</td>
<td>5 Days</td>
<td>Master Practitioner</td>
<td>‘An opportunity to become qualified through a Masters Programme’</td>
</tr>
<tr>
<td>Team problem solving-TRIZ consultancy</td>
<td>Project specific</td>
<td></td>
<td>‘Consulting support working with specialist teams on defined projects’</td>
</tr>
</tbody>
</table>

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