

OPERATIONAL EXCELLENCE.

Institution of
**MECHANICAL
ENGINEERS**

ACHIEVE OPTIMUM
QUALITY AND EFFECTIVENESS
IN YOUR PRODUCTS
AND PROCESSES.

Improving the world through engineering

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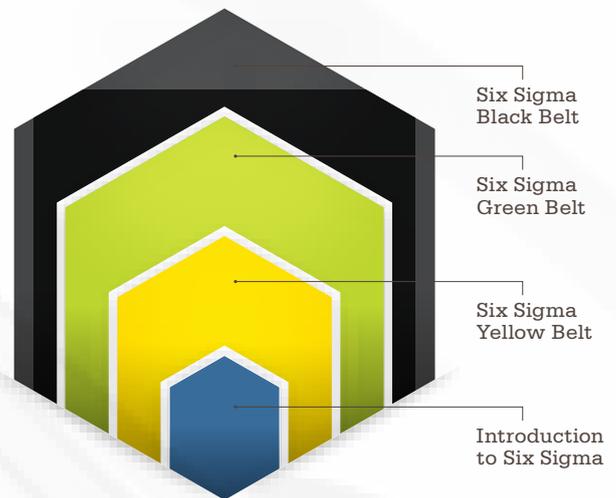
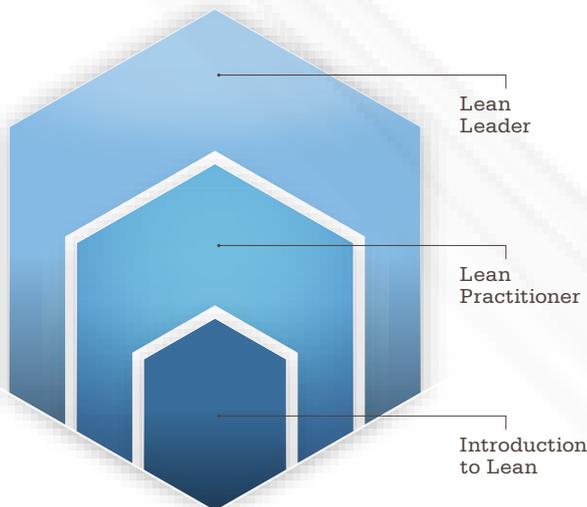
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OPERATIONAL EXCELLENCE.

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.

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.

21ST CENTURY TRIZ

SPC is a method of quality control that uses statistical methods to monitor and control a process. By developing process control charts, it becomes simpler to identify issues that require management intervention before they affect customer requirements.

STATISTICAL PROCESS CONTROL (SPC)

MSA helps to understand the accuracy and precision of your measurement systems. Measuring your data correctly ensures your business decision making is valid.

MEASUREMENT SYSTEMS ANALYSIS (MSA)

DoE is the art of understanding the relationship between process inputs and their effect on process outputs, with the aim of optimising a process through control of its inputs.

DESIGN OF EXPERIMENTS (DOE)

TOOL SETS

PROCESS MODELLING AND WASTE REDUCTION

Understanding what is truly happening within a process is the first step to being able to improve it. A process map is a visual representation of the complexity within an organisation and the act of mapping or modelling a process often highlights areas for improvement without further analysis.

PROCESS CAPABILITY

Understanding how capable processes are, in relation to customer requirements, is an important step in being able to fulfil customer demand and to understand how and where to focus business improvements.

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

FMEA is a dynamic planning methodology aimed at identifying and prioritising actions to avoid potential failure modes in a product, process or service and enables users to develop these to fully satisfy customer requirements.

ROOT CAUSE ANALYSIS (RCA)

Knowing how to identify and address problems at the root level is a crucial tool that supplements both Lean and Six Sigma at varying stages in order to develop desirable, long-term and sustainable outcomes.



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.



Lean

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.



Six Sigma

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.



Lean Six Sigma

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).

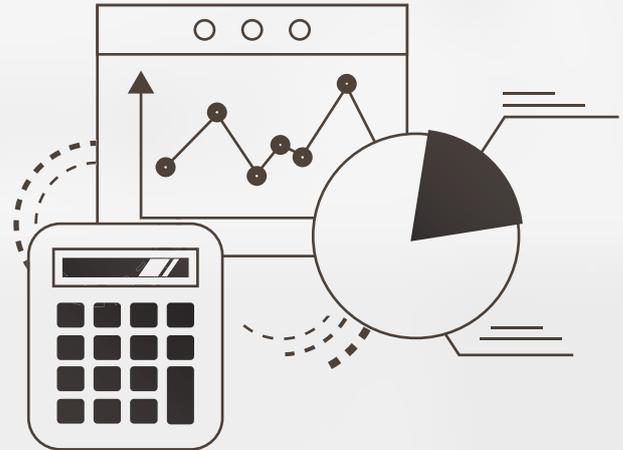
This has since been further developed and used in Toyota, and subsequently all industries, under the name 'Lean.'

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

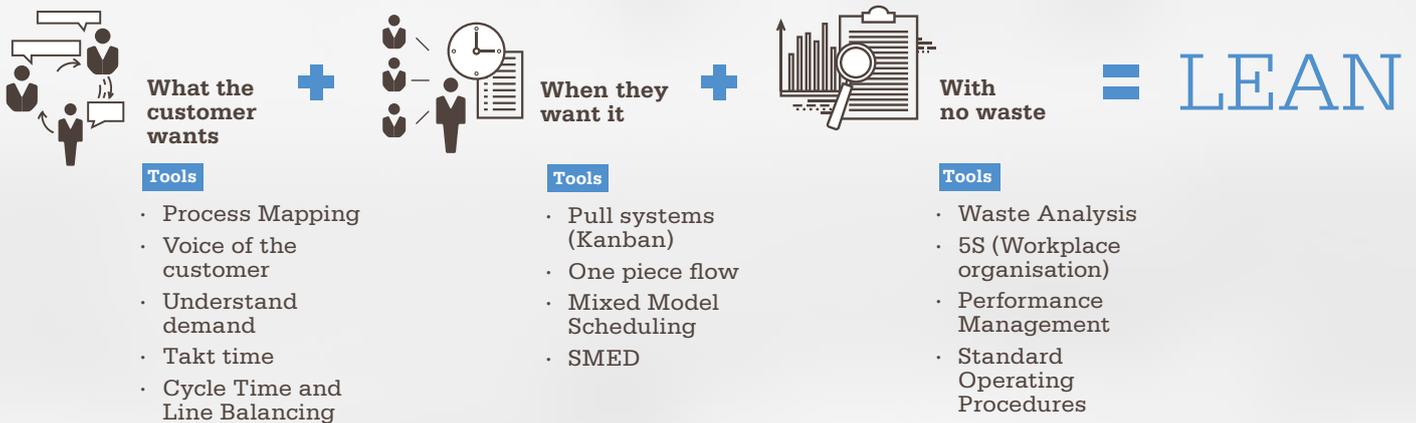


This is done by focussing on the identification and elimination of waste from all steps of the process, and can be assisted by the methodical application of appropriate tools. Lean tools and techniques can often be shared amongst the wider organisation through practical improvement exercises.

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:



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, focussing 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)

BENEFITS OF GOING LEAN

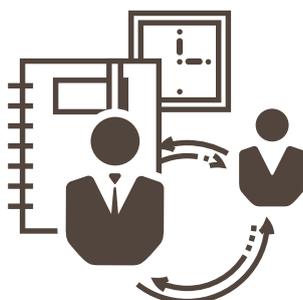
THE BENEFITS OF GOING LEAN CAN BE EXPERIENCED AT MULTIPLE LEVELS WITHIN AN ORGANISATION. BY USING EFFECTIVE LEAN PRINCIPLES, MANAGERS CAN DEVELOP

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, focussing 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:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Look at your processes differently? | <input checked="" type="checkbox"/> Identify who your customers are? |
| <input checked="" type="checkbox"/> Think solely of what your customers actually want? | <input checked="" type="checkbox"/> 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 work force 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**.

LEAN COURSES AND DEVELOPMENT STAGES:

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.



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.

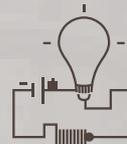
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THE BREAKDOWN: SIX SIGMA

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).

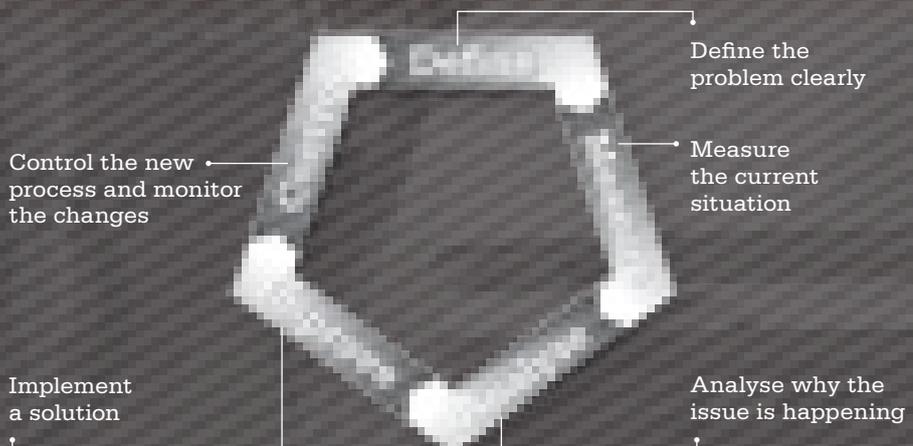
By the late 1990s, about two-thirds of the Fortune 500 organisations had begun Six Sigma initiatives with the aim of reducing costs and improving quality.

- 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).



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

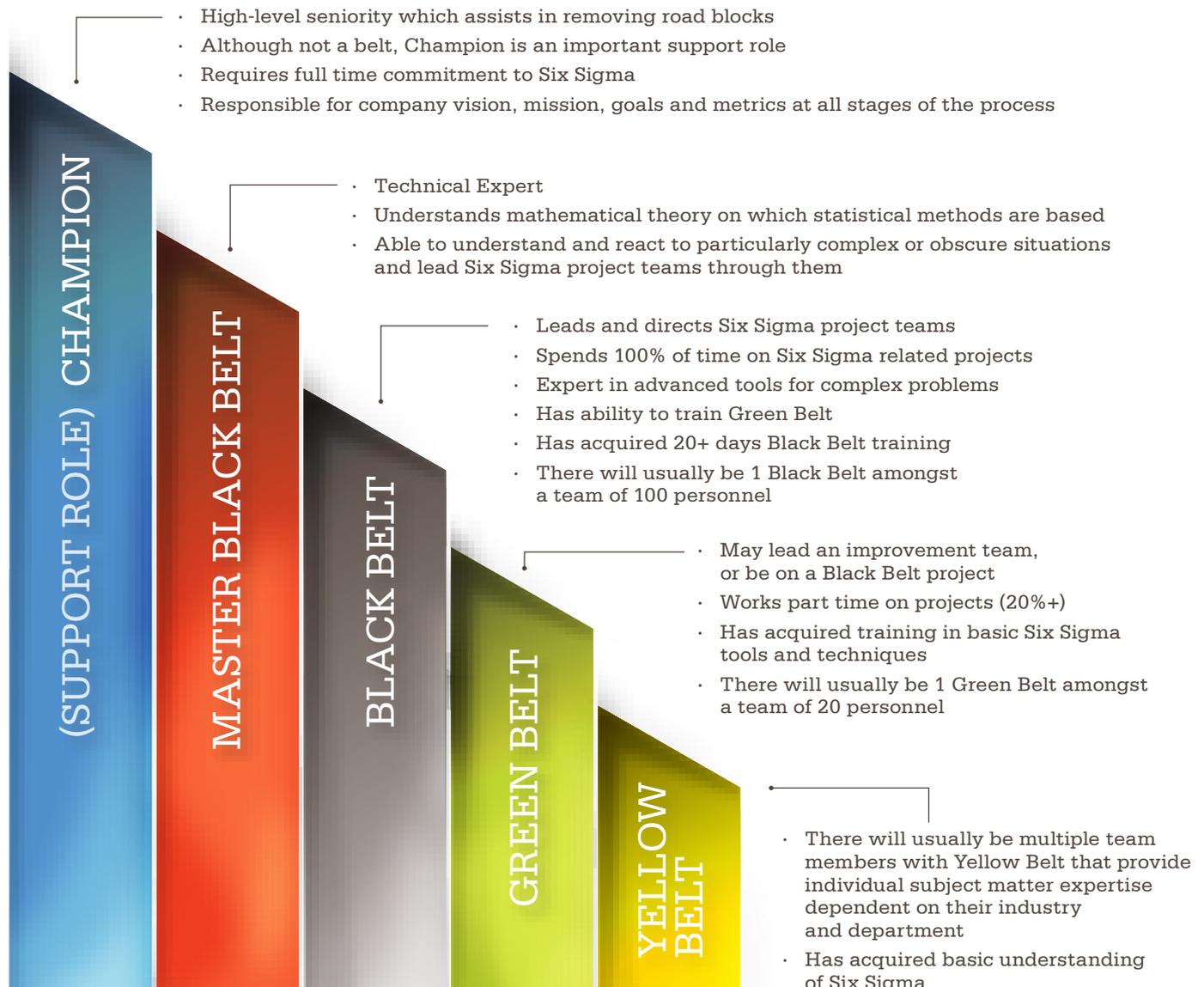
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SIX SIGMA BELTS – WHAT ARE THEY AND WHAT DO THEY DO?

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.



SIX SIGMA DEVELOPMENT STAGES

1. YELLOW BELT → 2. GREEN BELT → 3. BLACK 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.

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.

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.



The Master Black Belt and Champion programmes are available on demand.

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

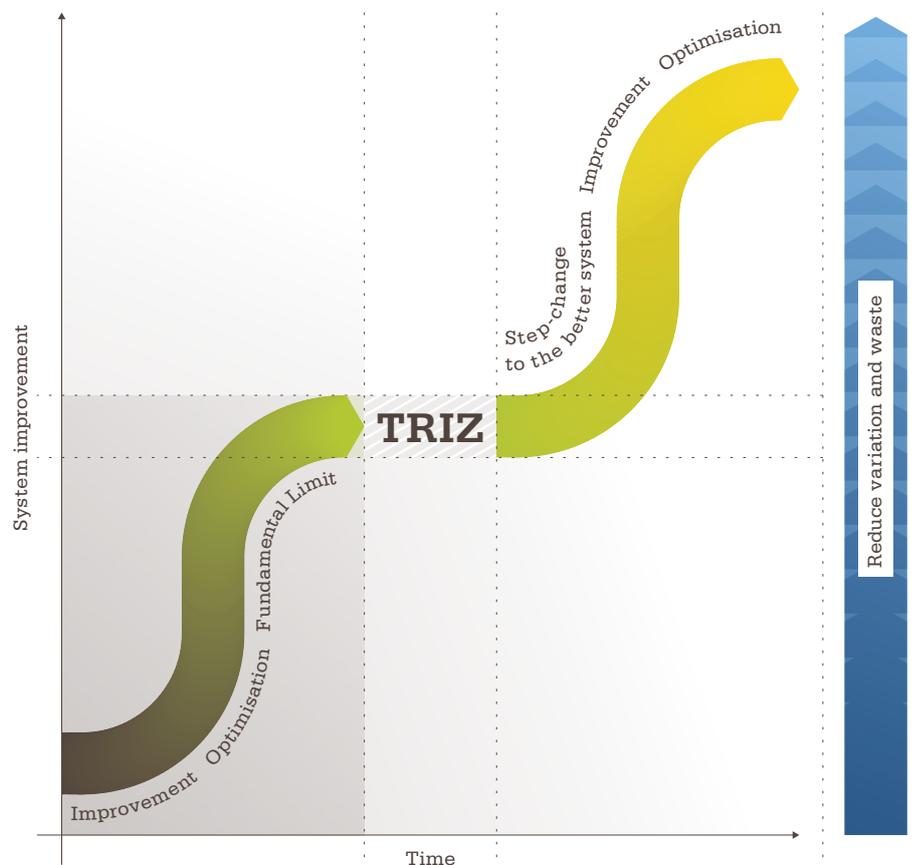
TRIZ - THEORY OF INVENTIVE PROBLEM SOLVING

(TEORIYA RESHENIYA IZOBRETATELSKIKH ZADATCH)

TRIZ STANDS STRONGLY AS A POWERFUL TOOL IN ITS OWN RIGHT THAT CAN BE USED TO SUPPORT INNOVATION (I.E. THE ACHIEVEMENT OF A COMMERCIALY 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.

 Course	 Duration	 Level	 Description
21 st Century TRIZ Day 1	1 Day	Introduction	'An introduction to the concept and the most used tools'
21 st Century TRIZ Day 2	1 Day	Appreciation and Application	'Bring a classic-problem that you are confronted with and let's work through it' More tools and extended discussion about how to link the use of the tools together.
21 st Century TRIZ Days 3 and 4	2 Days	Practitioner	'Let's get very specific with a group of 10 who bring with them real projects to work on' Delegates will be asked to pre-define and send in problems prior to the two day workshop to then work on in the workshop and push for some measurable ROI on their return to the workplace.
Masters	5 Days	Master Practitioner	'An opportunity to become qualified through a Masters Programme'
Team problem solving-TRIZ consultancy	Project specific		'Consulting support working with specialist teams on defined projects'

TRIZ represents the output of a study of over

70 years

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9 million

cases



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