LEAN
SIX SIGMA
BELGIUM

Training & Certification

Lean Six Sigma Master Black Belt

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Lean Six Sigma Master Black Belt – 13 days

Target Audience:

All sectors (industry and services)

- Project Managers / consultants (internal or external) in organization, quality, continuous improvement, or operational excellence
- Logistic Managers
- Supply Chain Managers
- Production Managers
- Operations Managers
- Quality Managers

Training Objectives:

Lean Management module

- Understand the philosophy, tools and principles of Lean Management.
- Assess the production capacity, wastage of resources and delivery time of a production unit, a flow of activities or an organization.
- Draw up a process map based on field observations in order to describe and communicate the reality of operations.
- Analyze a process to locate and quantify bottlenecks, overcapacity, waste and malfunctions of all kinds.
- Make operations faster, more agile, efficient and reliable.
- Develop a performance management system based on field indicators and problem-tracking routines.
- Conduct a flow and/or organizational efficiency problem-solving workshop based on the “Kaizen Event” approach.

Six Sigma Yellow Belt module

- Analyze the results of a customer satisfaction and expectations survey to identify the quality criteria to be improved.
- Assess the extent and cost of a quality problem.
- Determine the main root causes of a simple quality problem.
- Carry out a comparative assessment of different potential solutions.
- Develop a process performance management system.
- Conduct a DMAIC project to resolve a simple (“discernible”) quality problem.

Six Sigma Green Belt module

- Determine the key quality metric to enhance in the company's processes, based on an analysis of customer requirements.
- Define the operating parameters to be measured, how they are to be measured, and the sample of cases to be taken, to collect the data needed to carry out an analysis of non-quality factors.
- Approximately validate the reliability of the system for measuring the quality of the company's products or services, to be able to collect data that sufficiently reflects the reality of operations.
- Determine certain non-quality factors using statistical analysis with a view to achieve a first step of improvement.
- Develop a process performance management system based on statistical quality control.
- Conduct a DMAIC project to resolve a complex (“indistinguishable”) quality problem

Six Sigma Black Belt module

- Rigorously validate the precision and accuracy of a quality measurement system to enable the collection of high-quality data.
- Determine whether the process quality indicator is governed by a normal probability distribution to choose the most appropriate inferential statistical analysis tools.
- Using hypothesis testing and linear regression analysis, determine finely the non-quality factors on which to act to achieve a high level of quality.
- Identify the range of tests to be conducted in a factorial design of experiments to assess the impact of process operating conditions on product quality.
- Determine the best operating conditions for a process by analyzing the results of a factorial design of experiments.

Six Sigma Master Black Belt module

- Carry out a probabilistic capability study and check that a performance target has been achieved using specific hypothesis tests for all types of data and statistical distributions.
- Remove the indeterminacy about the influencing factors of a statistical problem by relying on an advanced use of hypothesis tests and sampling calculations for all types of data.
- Determine the optimal sampling strategy that maximize the effectiveness of a control chart.

- Design the optimum Lean Six Sigma organizational model tailored to the company's type, situation and constraints.
- Plan the deployment of Belts and improvement projects to achieve a company's or entity's operational ambitions in the long term.

Program:

Days 1 and 2 - Lean Management module

- History and positioning of Lean Management
- DMAIC and Kaizen Event method
- Process capability: cycle time and Takt time
- Work in progress, stock, lead time and Little's Law
- Value Stream Mapping (VSM)
- Load chart
- Analysis of added value and waste elimination
- Process Cycle Efficiency and Overall Process Efficiency
- First Pass Yield and Rolled Throughput Yield
- Theory of constraints and line balancing
- Continuous flow
- Pull flow and Kanban
- Visual Management, Poke-Yoke, 5S
- SMED
- Heijunka, dynamic capacity adjustment and standardization
- Maximum acceptable wok-in-progress (WIPmax)
- Kata and Short Interval Control
- Toyota Way
- Complex flow analysis
- Failure Modes and Effects Analysis (FMEA)

Days 3 and 4 –Six Sigma Yellow Belt module

- History and positioning of Lean Six Sigma
- Typology (LSSx.0) of DMAIC problems and projects
- **Define**

  Project launch
  SIPOC
  The 3 Voices
  Critical To Satisfaction
  Kano model
  Problem statement, objective statement and project opportunity statement
  Project Charter V1

- MAIC method to solve simple (“discernable”) statistical problems
- **Measure**
  Problem metric
  Measurement plan
  Measurement system validation, precision and accuracy (agreement analysis)
  Defective rate
  Project charter v2
  Analyze
  Pareto analysis
  Five Whys
  Project charter v3
- **Improve**
  Research and selection of the solution
  Business Case
  Implementation of the solution
  Improvement validation
  Control
  Process performance monitoring dashboard
  Response plan

Days 5, 6 and 7 – Six Sigma Green Belt module

- MAIC Method to solve complex (« indistinguishable ») statistical problems
- **Measure**
  Basic statistics and data types
  Project Y and defect definition
  Measurement plan
  Measurement system validation: R&R gauge, linearity and bias gauge
  Sampling and data validation
  Voice of Process analysis
  Capability
  Project charter v2
  Analyze
  Analysis approach Y = f (X’s)
  Ishikawa diagram
  Introduction to inferential statistics (confidence interval concept)
  Study of the influence on variation, central tendency, proportions and covariance analysis: contingency tables, graphical analysis (whisker boxes and scatter plots), correlation coefficient, analysis of confidence intervals
  Project charter v3

- **Improve**
  Statistical validation of the improvement
- **Control**
  Statistical process control
  I-EM, Xbarre-R, Xbarre-S, P and NP, U and C control charts
  Response plan

Days 8, 9 and 10 – Six Sigma Black Belt module

- **Measurement system analysis**
  Concordance analysis: Kappa and Kendall tests
  R&R gauge: ANOVA method and resolution of the measurement system
  Linearity study (regression method) and bias test
- **Hypothesis testing and regression analysis**
  Introduction to hypothesis testing
  Normality test
  Study of the influence on variation : tests for equality of variance
  Study of influence on central tendency ANOVA test, Mood median test, Kruskall-Wallis test
  Chi-2 test of association
  Pearson correlation test
  Simple and multiple linear regression analysis
- **Design of Experiments (DoE)**
  2-level factorial designs
  Design of Experiments resolution
  Number of repetitions
  Experiments execution
  Analysis of main effects and interaction effects
  Pareto of effects
  Response surface
  Response optimizer

Days 11, 12 and 13 – Six Sigma Master Black Belt module

- **Probabilistic capability analysis**
  Expected defective rate under normal, continuous non-normal, Poisson and binomial laws
  Data tranformation (Box-Cox, Johnson)
- **Hypothesis testing and regression analysis**
  Test power and sample size
  2-sample t-test, Mann-Whitney test
  2-variance test, Friedman test
  2-proportion test
  2-sample Poisson test
  1 sample t-test, 1-sample Sign test
  1 standard deviation test
  1 proportion test
  1-sample Poisson test
  Logistic regression
  Multiple and general regression
- **Statistical process control**
  Control chart effectiveness
  Time weighted charts
- **Lean Six Sigma Deployment**
  Global governance
  Process management system
  Ambition and Roadmap
  Lean Six Sigma Organization
  Roles and responsibilites (Champion, Sponsor, Process Owner, Belts)
  Project selection and process monitoring
  Expected benefits

Pedagogy and Learning resources

- Inductive teaching
  - Experimentation of the Lean improvement method (Kaizen Event) through a role-play simulating a cross-functional company process.
  - Learning the DMAIC method by means of a company case study used as a common thread throughout the training.
  - Learning the 'indistinguishable' problem-solving method on a service level improvement case (paper flying machines) carried out in class by the participants.
  - Carrying out a design of experiments in class on a problem of optimizing the geometry of paper flying machines.
  - Determining the capability of a screw production process.
  - Determining the capability of a printing process.
- Group of no more than 12 people facilitated in such a way as to encourage interactivity, the sharing of ideas and experience and the development of one's professional network.
- Use of JASP, Statoscopex and Minitab statistical analysis softwares.
- Provision of statistical calculators and analysis models in Excel.
- Training material provided in PDF format.
- Self-assessment and practice test at the end of the course.

Certification

Closed-book online examination with remote monitoring to be taken within 6 months after the course.

- Lean Management exam – MCQ - 25 questions – 50 minutes
- Six Sigma Master Black Belt exam – MCQ - 55 questions – 110 minutes

Passing criteria: ≥ 60 %

These exams validate the acquisition of basic knowledge in Lean Management and technical skills at the Six Sigma Master Black Belt level in accordance with the LSSx.0 knowledge body. The exams include a mix of recall questions (e.g. definitions), execution (e.g. calculations, tool selection), and application (e.g. drawing conclusions from results, making decisions in a given situation).