LSSa
lean six sigma academy

V Creating
World Class products

IV Creating
capable processes

III Creating
stable & efficient processes

II Creating a Continuous
Improvement culture

I Creating a solid foundation

LEAN BLACK BELT
SKILL SET

A GUIDELINE FOR LEAN BLACK BELT TRAINING AND CERTIFICATION

H.C. Theisens, D. Harborne, T. Hesp

VERSION 1.2

Lean Six Sigma Academy©

Title: Certification for Lean Black Belt training and certification

Authors: H.C. Theisens, D. Harborne, T. Hesp

Publisher: Lean Six Sigma Academy
                © Copyright LSSA BV, 2018
                Amersfoort

                www.lssa.eu
                info@lssa.eu

Version 1.2, July 2018

NUR 100

CONTENT

INTRODUCTION

Within the domain of Lean individuals can be trained and certified at three different levels. These levels are called Lean Yellow Belt (Foundation), Lean Green Belt (Practitioner) and Lean Black Belt (Expert).

Table 1. *Overview of Lean Belt levels*

Belt level	Level
Yellow Belt	Foundation
Green Belt	Practitioner
Black Belt	Expert

The LSSA - Lean Six Sigma Academy® was established in September 2009 with the objective to develop an international recognized certification scheme for all Lean and Lean Six Sigma Belt levels.

Training is provided through 'Accredited Training Organizations' (ATOs). It is recommended that candidates receive training through an ATO to prepare for certification. Alternatively, candidates who wish to self-study have the option to apply directly for certification.

The Lean Black Belt certification consists of a theoretical and a practical part. You will receive a partial certificate for both elements. The full Lean Black Belt certificate requires a sufficient for both the theoretical and the practical part.

THEORETICAL ASSESSMENT CRITERIA

The assessment criteria for the theoretical exam are as follows:

- The theoretical exam consists of 40 multiple choice questions.
- The pass mark for the exams is set at 63% (25 marks or more required to pass).
- The duration of the exams is 120 minutes.
- The exams are Open book exams, where a maximum of 2 books are allowed.
  (eBook or Pdf's are not allowed)
- A calculator is allowed.
- You must be able to identify yourself with photographic ID.

If you pass you will receive a 'Partial certificate' from the LSSA that states you passed the theoretical exam. You will receive the 'Full certificate' if you pass the practical assessment within a maximum period of three years after passing the theoretical exam.

PRACTICAL ASSESSMENT CRITERIA

This section describes the assessment criteria for the practical part of Lean Black Belt certification. It is necessary to submit one practical projects that meets the following criteria:

- One large Kaizen or Lean project must be submitted per person.
  (A 5S implementation or a small Kaizen project is not adequate).
- The project must be submitted within three years after the theoretical exam.
- Each project has a financial impact of at least € 20,000 on an annual basis.
- The project must follow the VSM, PDCA or DMAIC roadmap (about 25 Powerpoint slides).
- Projects are signed off by the Champion and / or Financial controller. They hereby declare that the project has been carried out professionally and that improvements are guaranteed.
- The language of the submitted project is English, Dutch or German.
- Projects must be submitted no later than three years after theoretical examination.

The project will be assessed by Master Black Belts assigned by the LSSA. It is strongly advised that the submission is also checked by an internal Lean Black Belt or Master Black Belt.

The result of the practical assessment will be either Pass or Fail. No score will be given. In the event of a 'Fail' result, brief guidance will be given on those criteria that are deemed 'Missing' or 'Incorrect'. Subsequently, a single retake resubmission is allowable.

Some people may want to use this project later on to apply for Lean Six Sigma Black Belt certification. This is allowed in case the project meets the concerning Lean Six Sigma criteria, which are more stringent than the criteria for Lean certification. Please check the Lean Six Sigma Black Belt skill set at www.lssa.eu.

CONTINUOUS IMPROVEMENT MATURITY MODEL (CIMM)

The LSSA skill sets are based on the 'Continuous Improvement Maturity Model' (CIMM). This is a framework that guides an evolutionary staged approach for process improvement from a very early stage till delivering world class products. CIMM summarizes all best practices elements of many different improvement methods in one framework, along two axes.

CIMM Axis 1 - Organization Development
The first axis focuses on the developing the employees and the organization. Organizational development can relate to the development of products and services, improvement of efficiency, market development, and so forth. CIMM describes the development of leadership, the development of employee's competencies, the development of organizational culture and the way in which the organization is managed.

Figure 1 - CIMM Organizational Development (LSSA, 2017)

CIMM Axis 2 - Process Improvement

The second axis focuses on improving processes. In order to implement the strategy, the organization must continuously simplify, align and improve its processes. CIMM describes the creation of a solid foundation, an improvement culture, stable and predictable processes, capable processes and future-proof processes.
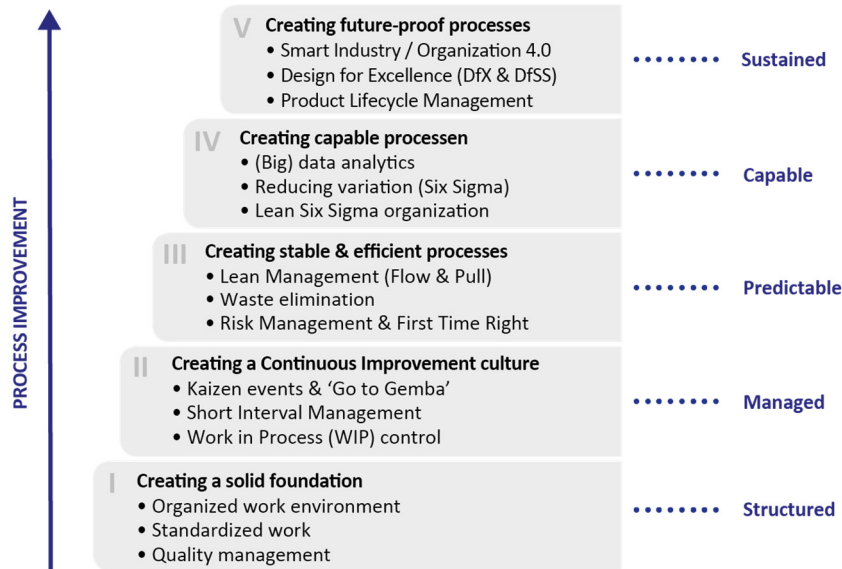
Figure 2 – CIMM Process Improvement (LSSA, 2017)

The following chapters describe the theoretical skill set elements. The structure consists of a number of 'Units', 'Elements' and 'Performance Criteria'.

- **Unit:** The skill set is presented by skill set areas; each called a 'Unit'. The chapters in the book 'Climbing the Mountain' reflect the 'Units' described in this skill set.
- **Element:** Each 'Unit' consists of a number of 'Elements'. The paragraphs in each chapter of the book 'Climbing the Mountain' reflect the 'Elements' in this skill set.
- **Performance Criteria:** Each 'Element' consists of a number of 'Performance Criteria' and each 'Performance Criteria' has an explanation. These describe the tools, techniques and competencies that are required to be achieved by the Black Belt.
- **Level of Cognition:** A 'Cognitive Level' has been assigned to each 'Performance Criteria'-description according to Bloom's Taxonomy [Appendix A]. This defines at which level the Black Belt is expected to apply the respective tool, technique or skill. This is the minimum level the Black Belt must be able to demonstrate in order to be assessed as competent.

U1.   WORLD CLASS PERFORMANCE

The Unit 'World Class Performance' reviews the general philosophy of Process Improvement. It discusses the overview of different process improvement methods and the history of the most important methods. It also explains why process improvement is needed.

E1.   COMPETITIVE STRATEGIES

The Learning Element 'Competitive strategies' explains Operational Excellence, Customer Intimacy and Product Leadership. It also explains how Operational Excellence can be applied to processes in different types of enterprises.

U1.E1.PC1   Operational Excellence, Customer Intimacy & Product Leadership   Understand
Understand the three competitive strategies. Understand how Operational Excellence can be applied in different types of enterprises e.g. manufacturing, service, transactional, product and process design and innovation.

U1.E1.PC2   Physical vs. Transactional processes   Apply
Describe the similarities and differences between physical processes and transactional processes.

E2.   HISTORY OF CONTINUOUS IMPROVEMENT

The Learning Element 'History of Continuous Improvement' explains the history of quality management and process improvement.

U1.E2.PC1   History of continuous improvement   Understand
Understand the origins of Quality management, Lean and Six Sigma.

E3.   PHILOSOPHY & PRINCIPLES

The Learning Element 'Philosophy & Principles' explains the values and principles of Lean. Similarities and differences to other improvement methods are also reviewed.

U1.E3.PC1   Value and foundations of Lean   Apply
Propagate the value of Lean, its philosophy, history and goals.

U1.E3.PC2   Lean principles   Apply
Describe the Toyota philosophy, the 14 principles and the House of Quality. Understand the impact of the Toyota Production System (TPS) on strategy, quality and production.

E4.   ORGANIZATIONAL PROCESS MANAGEMENT

The Learning Element 'Organizational Process Management' explains the cohesion between business strategy, systems, processes and performance.

U1.E4.PC1   **Continuous Improvement Maturity Model**   **Apply**
Demonstrate how to apply the two axis of the CIMM framework to develop organizations and to improve processes.

U1.E4.PC2   **Business processes performance**   **Apply**
Define and implement various business performance measurement systems, including balanced scorecard, key performance indicators (KPIs), and the financial impact of customer loyalty. Understand how these can be applied in different functional areas.

U1.E4.PC3   **Process improvement planning**   **Apply**
Define the right process improvement strategy, based on the current maturity level of the organization. Define breakthrough opportunities and select process improvement methods and techniques to achieve business objectives.

U1.E4.PC4   **Strategy development**   **Apply**
Apply the strategic planning process of Hoshin Kanri and how it forms the link between strategic mission and vision, tactical project plans and individual action plans.

E5.   PROJECT SELECTION PROCESS

The Learning Element 'Project Selection Process' explains how projects are selected based on the strategy of the organization and financial measures.

U1.E5.PC1   **Financial measures**   **Apply**
Define and use financial measures e.g. cost of poor quality (COPQ), net present value (NPV), return on investment (ROI) and working capital (WC).

U1.E5.PC2   **Project selection**   **Apply**
Define project selection criteria. Identify process improvement opportunities. Apply project selection techniques to select the projects that contribute to the strategy of the organization.

U2.   PROJECT MANAGEMENT

The Unit 'Project Management' outlines the way improvement projects should be executed. It starts with the identification of customers and its requirements. The Unit also covers a number of project management roadmaps, team formation, the project charter and a number of project management tools.

E1.   TEAM FORMATION

The Learning Element 'Team Formation' reviews the different role and responsibilities within and around an improvement team. It also reviews how a team is formed.

U2.E1.PC1   **Roles and Responsibilities**   **Apply**

Promote the Lean levels of expertise: Master Black Belt, Sensei, Black Belt, Green Belt and Yellow Belt. Describe various team roles and responsibilities: Deployment leader, Champion, Project leader, Coach, and Team member.

U2.E1.PC2   **Team member selection**   **Apply**

Facilitate the team member selection process, which includes required competences, subject matter expertise and availability. Select the proper resources so that a team is staffed for success.

E2.   PROCESS IMPROVEMENT ROADMAPS

The Learning Element 'Process Improvement Roadmaps' reviews a number of roadmaps, including Plan-Do-Check-Act (PDCA) and Define, Measure, Analyze, Improve and Control (DMAIC).

U2.E2.PC1   **Kaizen Roadmap**   **Apply**

Apply project management methods that can be used in the workplace for Kaizen initiatives e.g. PDCA, A3-report.

U2.E2.PC2   **Problem Solving Process (8D)**   **Apply**

Apply the eight disciplines problem solving process which is used to approach and resolve problems.

U2.E2.PC3   **DMAIC Roadmap**   **Apply**

Apply the DMAIC roadmap for breakthrough projects. Select the proper tools to use during the Process Improvement project.

E3. VOICE OF THE CUSTOMER (VOC)

The Learning Element 'Voice of the Customer' reviews customer identification (internal/external) and customer requirements.

U2.E3.PC1   **Customer identification**   **Apply**

Define the customer segment for each project and demonstrate how the project will impact both internal and external customers.

U2.E3.PC2   **Customer requirements**   **Apply**

Apply the translation of customer statements into customer needs with focus on latent and non-addressed needs. Understand the experience of customers linked to product features described in the range from dissatisfied, expected, satisfied and desired quality levels e.g. new KANO model.

U2.E3.PC3   **Critical to quality (CTQ)**   **Apply**

Define and describe various CTx requirements (critical to quality (CTQ), cost (CTC), process (CTP), safety (CTS) and delivery (CTD)) and align projects with those requirements.

U2.E3.PC4   **CTQ Flowdown**   **Apply**

Translate the Voice of Customer (VOC) into external CTQs and internal CTQs. Construct a CTQ flowdown that represents the key measurable characteristics of a product or process whose performance standards or specification limits must be met.

U2.E3.PC5   **Customer loyalty**   **Apply**

Identify and apply the appropriate survey method (e.g. Net Promotor Score, focus groups and observations) to gather customer feedback to better understand their needs, expectations requirements and desires. Ensure that the instruments used are reviewed for validity and reliability to avoid introducing bias or ambiguity in the responses.

E4. PROJECT CHARTER

The Element 'Project Charter' covers the description of the project such as problem description, objectives, scope, timing and benefits.

U2.E4.PC1   **Problem statement**   **Analyze**

Develop and analyze the problem statement in relation to customer requirements and business goals.

U2.E4.PC2   **Project scope and goal**   **Analyze**

Develop and review project boundaries to ensure that the project has value to the customer (scope). Develop the objectives and measurable targets for the project based on the problem statement and scope (goal).

U2.E4.PC3   **Project performance measures**   **Analyze**
Select and analyze performance measurements (Cost, Quality and Delivery) and establish key project metrics that relate to the voice of the customer.

U3.E4.PC4   **Project benefits calculation**   **Analyze**
Define and calculate the hard benefits of the project and describe the soft benefits of the project.

E5.   PROJECT MANAGEMENT TECHNIQUES

The Element 'Project Management Techniques' reviews a number of tools that are used during execution of the project.

U2.E5.PC1   **Time management**   **Apply**
Propagate the importance and basic disciplines of time management. Apply the elements of time management. Set up team meetings, publish agendas and ensure that the right people and resources are available.

U2.E5.PC2   **Project progress**   **Apply**
Apply project planning tools such as Gantt charts, critical path method (CPM) and program evaluation and review technique (PERT) charts. Apply basic disciplines of time management e.g. attending meetings, arriving on-time, coming prepared, being punctual and to the point. Organize Tollgate reviews to review progress with the Champion or project board.

U2.E5.PC3   **Project risk management**   **Analyze**
Lead the development of risk analysis including resources, finance, customer impact, quality etc. Define mitigation actions.

U2.E5.PC4   **Project documentation**   **Analyze**
Develop the proper vehicle for presenting project documentation (e.g. spreadsheet output and storyboards). Create project documentation in line with standard organization templates. Set up a structure to store project documentation properly.

U2.E5.PC5   **Lessons learned**   **Apply**
Demonstrate and document the lessons learned from all phases of a project and identify how improvements can be replicated and applied to other processes in the organization.

U3.   LEVEL I – CREATING A SOLID FOUNDATION

The Unit 'Creating a solid foundation' reviews how to achieve a solid foundation for further process improvement programs. This foundation consists of a proper and organized work environment, reliable equipment and standardized work.

E1.   ORGANIZED WORK ENVIRONMENT

The Learning Element 'Organized work environment' is about good housekeeping and how to set up a proper and safe work environment in a structured manner.

U3.E1.PC1   **Organized work environment (5S)**   **Analyze**
Develop an organized work environment by applying 5S (Sort, Straighten, Shine, standardize, Sustain). Understand that an organized environment will improve safety and moral.

E2.   STANDARDIZED WORK

The Learning Element 'Standardized work' is about implementing and improving standards.

U3.E2.PC1   **Standardized work and Documentation**   **Apply**
Standardize tasks and processes to establish the foundation for continuous improvement and employee empowerment. Develop or modify documents, standard operating procedures (SOPs) and single-point-lessons to ensure that the improvements are sustained over time.

E3.   QUALITY MANAGEMENT

The Learning Element 'Quality Management' is about developing procedures to identify and detect defects. Also preventing mistakes and avoiding problems will be discussed.

U3.E3.PC1   **Quality Management System**   **Apply**
Propagate the quality management system and procedures. Identify opportunities for improvement.

U3.E3.PC2   **Ongoing evaluation and auditing**   **Apply**
Identify and apply tools for the ongoing evaluation of the improved process, including auditing (internal / external), monitoring for new constraints and identification of additional opportunities for improvement.

U4.   LEVEL II – CREATING A CONTINUOUS IMPROVEMENT CULTURE

The Unit 'Creating a continuous improvement culture' reviews how to create a continuous improvement culture at the shop floor. This Unit reviews setting up and facilitate Kaizen teams. It also reviews a number of problem solving techniques and tools.

E1.   KAIZEN

The Learning Element 'Kaizen' reviews how to organize and facilitate improvement teams at the shop floor that work on Kaizen improvement initiatives.

U4.E1.PC1   **Short Interval Management**   **Apply**
Implement Short Interval Management, Stand Up meetings and corrective actions.

U4.E1.PC2   **Visual Workplace**   **Analyze**
Develop the elements of Visual Workplace and describe how they can help to control the improved process.

U4.E1.PC3   **Root Cause Analysis**   **Analyze**
Develop root cause analysis, recognize the issues involved in identifying a root cause. Analyze problems by applying problem solving process and tools.

U4.E1.PC4   **Kaizen events**   **Apply**
Empower and facilitate improvement teams and Kaizen events.

E2.   BASIC QUALITY TOOLS

The Learning Element 'Basic Quality Tools' reviews a number of basic quality tools.

U4.E2.PC1   **Visualization of data**   **Apply**
Propagate the purpose and use of data visualization, analysis and communication.

U4.E2.PC2   **Basic Quality Tools**   **Analyze**
Apply and analyze the outcome of basic quality tools: Check sheet, Pareto chart, Scatter plot, Bar chart, Pie chart, Time Series Plot, Histogram and Box plot.

E3.   BASIC MANAGEMENT TOOLS

The Learning Element 'Basic Management tools' reviews a number of tools that are very powerful in the problem solving process.

U4.E3.PC1   **Brainstorm Techniques**   **Apply**
Apply brainstorm techniques: Affinity diagram, 5-Why's and Ishikawa.

U4.E3.PC2   **Decision making**   **Apply**
Select and apply decision making techniques e.g. Cause & Effect matrix and multi-voting.

U5.   LEVEL III – CREATING STABLE AND EFFICIENT PROCESSES

The Unit 'Creating stable and efficient processes' reviews how the logistical flow of processes can be improved and made more stable, predictable and efficient. This Unit also reviews tools which can be used to visualize and analyze the process flow. This unit also reviews a number of tools and techniques that can be used to improve efficiency, effectiveness, productivity and agility of processes. All Level III Learning Elements and Performance Criteria follow the DMAIC structure.

DEFINE

E1.   PROCESS MAPPING

The Learning Element 'Process Mapping' reviews a number of tools to map the process flow that can be used in Lean projects.

U5.E1.PC1   **Process Flow diagram**   **Apply**
Apply process mapping to visualize the flow of activities and decisions within a process.

U5.E1.PC2   **High level process description**   **Analyze**
Distinguish between key process input variables and key process output variables based on a high level process map e.g. SIPOC.

MEASURE

E2.   LEAN PERFORMANCE

The Learning Element 'Lean Performance Metrics' reviews different types of data, measurement scales and Lean performance metrics. This Element also reviews process flow analysis.

U5.E2.PC1   **Process Flow analysis**   **Analyze**
Analyze process flow and utilization. Apply Little's Law.

U5.E2.PC2   **Performance metrics**   **Analyze**
Analyze Lean performance metrics e.g. takt time, cycle time, lead time, queue time, WIP, yield and OEE.

U5.E2.PC3   **Defects and Defectives**   **Apply**
Distinguish and calculate process performance metrics (e.g. PPM, DPU and RTY). Describe the difference between a defect and a defective.

E3.   MEASUREMENT SYSTEMS

The Learning Element 'Measurement systems' reviews different measurement methods and techniques. This Element also reviews types of data, measurement scales and data collection tools.

U5.E3.PC1   **Metrology**   **Apply**
Apply elements of metrology, including calibration systems, traceability to reference standards, the control and integrity of standards and measurement devices.

U5.E3.PC2   **Measurement methods**   **Apply**
Define and implement measurement methods.

U5.E3.PC3   **Data types**   **Analyze**
Describe and distinguish between qualitative and quantitative data (continuous and discrete data).

U5.E3.PC4   **Measurement scales**   **Analyze**
Define and analyze nominal, ordinal, interval and ratio measurement scales. Apply Likert scale to convert an ordinal scale into a discrete or continuous interval scale.

U5.E3.PC5   **Data collection tools**   **Analyze**
Define and analyze tools for collecting data e.g. data sheets, check sheets, concentration diagrams and questionnaires.

ANALYZE

E4.   VALUE STREAM ANALYSIS

The Learning Element 'Value Stream Analysis' reviews how to create a Value Stream Map of the current situation.

U5.E4.PC1   **Value Adding versus Non Value Adding**   **Analyze**
Distinguish value added from non-value added activities.

U5.E4.PC2   **Value Stream Mapping (Current State)**   **Apply**
Apply Value Stream Mapping to construct a Current State Map of the process to identify waste and non-value added activities.

E5. BASIC STATISTICS

The Learning Element 'Basic statistics' reviews the basic terms of sample and descriptive statistics.

U5.E5.PC1   **Descriptive statistics**   **Apply**

Calculate population parameters and sample statistics e.g. proportion, mean and standard deviation.

U5.E5.PC2   **Variation**   **Analyze**

Evaluate special cause and common cause variation.

E6. CORRELATION AND REGRESSION

The Learning Element 'Correlation and Regression' describes the predictive models using regression techniques to determine the relation between factors on a response.

U5.E6.PC1   **Correlation coefficient**   **Analyze**

Calculate and analyze the correlation coefficient. Determine its statistical significance (p-value) and recognize the difference between correlation and causation.

U5.E6.PC2   **Regression analysis**   **Analyze**

Apply linear and polynomial regression analysis. Analyze the regression model for estimation and prediction. Interpret the residual analysis to validate the model.

IMPROVE

E7. REDUCING MUDA (WASTE)

The Learning Element 'Reducing Muda' reviews how to identify Waste in the organization and in the processes.

U5.E7.PC1   **Waste identification (for the Operation)**   **Analyze**

Identify and analyze the 8 types of operational waste (Muda); Overproduction, Waiting, Transport, Overprocessing, Inventory, Movement, Defects, Unused expertise.

U5.E7.PC2   **Waste identification (for the Customer)**   **Analyze**

Identify and analyze the 7 types of customer waste (Muda); Opportunity Loss, Delay, Unnecessary Movement, Duplication, Incorrect inventory, Unclear Communication and Errors.

E8.   REDUCING MURI (OVERBURDEN)

The Learning Element 'Reducing Muri ' reviews how to identify overburdening the organization and how to implement flow and work balancing to reduce overburden. This element also reviews the relations between Lean with TPM and TOC.

U5.E8.PC1   **Flow**   **Analyze**

Describe the importance of flow for reducing Muri. Develop flow in the organization.

U5.E8.PC2   **Work balancing**   **Analyze**

Describe the importance of Work balancing for reducing Muri. Develop Work balancing.

U5.E8.PC3   **Total Productive Maintenance (TPM)**   **Apply**

Describe the eight pillars of TPM and describe how it can be used for process improvement. Apply elements of TPM to control the improved process.

U5.E8.PC4   **Competence Management (Skill Matrix)**   **Apply**

Describe how competence management supports the reduction of Muri. Set up and apply a competence management system.

E9.   REDUCING MURA (UNEVENNESS)

The Learning Element 'Reducing Mura ' reviews how to identify unevenness in the organization and in the processes. This element also reviews a number of techniques to reduce unevenness.

U5.E9.PC1   **Pull**   **Analyze**

Describe the importance of pull for reducing Mura. Develop and implement pull in the organization by applying Kanban systems.

U5.E9.PC2   **Volume and Type leveling**   **Apply**

Implement a balanced process flow by both volume leveling, type leveling and one piece flow.

U5.E9.PC3   **Quick Change Over (SMED)**   **Apply**

Reduce change over times by implementing Single Minute Exchange of Die (SMED).

E10. VALUE STREAM IMPROVEMENT

The Learning Element 'Value Stream Improvement' reviews how the techniques and tools that reduce Muda, Muri and Mura can be applied in constructing a Future State Value Stream Map.

U5.E10.PC1   **Value Stream Mapping (Future State)**   **Apply**

Define the gap between the current state and the target condition. Prepare a Future state map using Value Stream Mapping. Apply techniques to reduce Muda, Mura and Muri.

CONTROL

E11. FIRST TIME RIGHT

The Learning Element 'First Time Right' looks at how results that have been achieved in process improvement projects can be sustained. This element reviews the following techniques and principles: Process FMEA, Control plan, Jidoka and Poka Yoke.

U5.E11.PC1   **Process FMEA (pFMEA)**   **Apply**

Prepare all elements of a Process FMEA, calculate the risk priority number (RPN) and review the effect of FMEA results on processes, products and services.

U5.E11.PC2   **Control plan**   **Apply**

Prepare a control plan to document and hold gains. Define controls and monitoring systems. Transfer of responsibility from the project team to the process owner.

U5.E11.PC3   **Jidoka & Poka Yoke**   **Apply**

Implement a culture of stopping to fix problems to get quality right the first time. Empower the work force to stop the line when there is a quality problem. Apply Poka Yoke to prevent quality problems.

E12. STATISTICAL PROCESS CONTROL (SPC)

The Learning Element 'Statistical Process Control' explains the controls methods used to identify out-of-control situations and deviations over time. Different types of SPC charts are reviewed.

U5.E12.PC1   **SPC Objectives and benefits**   **Understand**

Describe the objectives and benefits of SPC, including monitoring and controlling process performance. Apply SPC for reducing variation in a process.

U5.E12.PC2   **Control charts**   **Apply**

Apply the following types of control charts: Xbar-R, P, NP, C and U.

U5.E12.PC3   **Tests for Special Causes**   **Understand**

Interpret control charts and out of control situations. Apply the rules for determining statistical control.

U6.   PRODUCT AND PROCESS DEVELOPMENT

The Unit 'Product and Process development' is about applying Lean principles and techniques to develop products, services and processes from an early stage in the development phase.

E1.   PRODUCT LIFECYCLE MANAGEMENT (PLM)

The Learning Element 'Product Lifecycle Management' reviews the process of managing the entire lifecycle of products and services. The product lifecycle is the collective stages that a product or service goes through from its conception and design through to its ultimate disposal.

U8.E1.PC1   **Product Lifecycle Management**   **Understand**
Understand the lifecycle for products and services, efficiently and cost-effectively, from ideation, design and manufacture, through to service and disposal.

U8.E1.PC2   **Innovation management**   **Apply**
Propagate the importance of innovation of products, services and processes.
Describe the difference between innovation, invention and continuous improvement.

U8.E1.PC3   **Product and process development**   **Apply**
Apply methods for new product and process development.

U7. LEAN DEPLOYMENT PROCESS

The Unit 'Lean Deployment process' reviews how Lean programs should be deployed across the organization. It explains the role and responsibilities of Leadership in its efforts to coach and inspire improvement teams. Also team development and change management aspects will be reviewed.

E1. MANAGEMENT OF CHANGE

The Learning Element 'Management of Change' reviews the dynamics that can occur during a project such as cooperation, resistance, escalation of problems and solving roadblocks.

U7.E1.PC1   **Organizational culture**   **Apply**

Describe and use various techniques for facilitating and management of change. Describe the impact an organization's culture and inherent structure can have on the success of Lean.

U7.E1.PC2   **Change Management approaches**   **Apply**

Describe how deployment failure can result from the lack of resources or management support. Organize a Top-Down approach and facilitate a Bottom-Up approach.

U7.E1.PC3   **Stakeholder analysis**   **Apply**

Prepare a stakeholder analysis. Describe the impact Lean projects can have on process owners, internal and external customers and other stakeholders in a project.

E2. LEAN LEADERSHIP

The Learning Element 'Leadership' explains the roles and responsibilities of executive leaders. This includes effective communication, motivating, coaching and rewarding improvement teams.

U7.E2.PC1   **Learning organization**   **Understand**

Demonstrate leadership in the deployment of process improvement. Implement and facilitate learning and competence development within the organization.

U7.E2.PC2   **Effective communication**   **Apply**

Use appropriate communication methods (both within the team and from the team to various stakeholders) to report progress, conduct milestone reviews and support the overall success of the project.

U7.E2.PC3   **Team performance and motivation**   **Apply**

Demonstrate team progress in relation to goals, objectives and other metrics that support team success and reward and recognize the team for its accomplishments. Describe and apply techniques that motivate team members and support and sustain their participation and commitment.

U7.E2.PC4   **Coaching**   **Apply**

Apply coaching of all employees involved in process improvement e.g. Toyota Kata.

E3.   TEAM DEVELOPMENT

The Learning Element 'Team Development' reviews various types of teams, team stages, team dynamics and setting up a training plan.

U2.E3.PC1   **Team Stages**   **Apply**

Facilitate the team through the classic stages of development: forming, storming, norming, performing, adjourning and recognition.

U2.E3.PC2   **Personality Types**   **Understand**

Understand the four basic personality types (MBTI) and use appropriate communications.

U2.E3.PC3   **Team Roles**   **Understand**

Understand the nine team roles (Belbin) and select team members with appropriate natural strengths.

APPENDIX A – BLOOM'S TAXONOMY FOR PERFORMANCE CRITERIA

In addition to specifying content, each performance criteria in this skill set also indicates the intended complexity level of the test questions for each topic. These levels are based on 'Levels of Cognition' (from Bloom's Taxonomy – Revised, 2001), and can be used to create learning outcomes for students.

The Taxonomy of Educational Objectives, often called Bloom's Taxonomy, is a classification of the different objectives that educators set for students (learning objectives). The taxonomy was proposed in 1956 by Benjamin Bloom, an educational psychologist at the University of Chicago. During the nineties, Lorin Anderson a former student of Bloom revisited the cognitive domain in the learning taxonomy. Bloom's Taxonomy divides educational objectives into three 'domains': Affective, Psychomotor and Cognitive. This Skill set only notices the Cognitive domain. The 'Levels of Cognition' are in rank order - from least complex to most complex. The Black Belt skill set only uses the levels 'Understand', 'Apply and 'Analyze'.

Remember
Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc. The LSSA uses the following verb at this level: Recall.

Understand
Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc. The LSSA uses the following verbs at this level: Describe, Follow, Identify, Interpret, Participate, Understand.

Apply
Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc. The LSSA uses the following verbs at this level: Apply, Assure, Calculate, Define, Demonstrate, Divide, Eliminate, Empower, Facilitate, Implement, Motivate, Organize, Plan, Prepare, Present, Promote, Propagate, Review, Select, Standardize, Support, Use.

Analyze
Break down information into its constituent parts and recognize their relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario. The LSSA uses the following verbs at this level: Analyze, Construct, Design, Develop, Distinguish, Evaluate, Lead, Manage, Translate.

Evaluate
Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards. The LSSA does not uses this level in their skill sets.

Create
Put parts or elements together in such a way as to reveal a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn. The LSSA does not uses this level in their skill sets.