Lean Six Sigma

Green Belt for Service Skill Set

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1 Introduction

1.1 LSSA - Lean Six Sigma Academy

It is important for businesses and organisations to continuously focus on customer satisfaction by supplying products or services with outstanding quality, cost efficiently and within the agreed lead time. Improving quality and efficiency is the domain of ‘Process Improvement’.

Realising these objectives is effectively achieved by applying Lean Six Sigma: a combination of Lean Manufacturing and Six Sigma approaches. Both management strategies are well established with proven success and are among the most applied process improvement methods in the world. Lean Six Sigma is a clear, practical and structured method to reduce lead times, production losses, quality complaints and operational expenses.

Within Lean Six Sigma, individuals can be trained at various ‘Belt levels’. These levels are called Black Belt, Green Belt, Orange Belt and Yellow Belt.

<table>
<thead>
<tr>
<th>Belt level</th>
<th>Vocational Education Training</th>
<th>Adult Education – Job roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Belt</td>
<td>Initial VET secondary level</td>
<td>Team members</td>
</tr>
<tr>
<td>Orange Belt</td>
<td>-</td>
<td>Administrative and financial departments Other supporting departments</td>
</tr>
<tr>
<td>Green Belt</td>
<td>Higher Education</td>
<td>Process owners, Employees in Quality</td>
</tr>
<tr>
<td>Black Belt</td>
<td>-</td>
<td>Project Managers, Management, Consultants</td>
</tr>
</tbody>
</table>

The LSSA – Lean Six Sigma Academy – was established in September 2009 with the main objective to determine a common certification standard for Lean Six Sigma job roles. This has been realised by developing several skill sets with clear criteria.
2 Skill Definition Model

2.1 Skill Set Strategy

A skill set is a group of specific Learning Element that one should be able to apply within a certain job role. A standard group of skill sets within Europe is necessary due to the free mobility of workers. European countries such as the UK, The Netherlands, and France already have well-established open learning courses which support APL (Accreditation of Prior Learning). Within APL the skills of students are assessed, existing skills are recognised, and a learning plan is developed to cover any skill gaps. The skill assessment is based on defined skill units and a skill profile which indicates how many skill units have been covered.

LSSA has developed four skill sets that specify which of the overall Lean Six Sigma tools are expected to be included within a certain Belt level. A skill set is a group of ‘Learning Elements’ within eight ‘Skill Units’. ASQ (American Society for Quality) Body of Knowledge [5], [6] documents were used as a baseline, and have been updated according the latest insights. Each of the ‘Learning Elements’ contains several ‘Performance Criteria’. Each ‘Performance Criteria’ has an explanation and a cognitive level according to Bloom [8] which should be applied. The skill sets are used by the Examination Development Committee and to help candidates prepare for the exam.

2.2 Definitions

The skill sets are based on the skills definition proposed by the DTI (Department of Trade and Industry) in the UK for NVQ (National Vocational Qualification) standards [2] and revised skill cards from other countries. It contains the following items:

- **Domain**: An occupational category. E.g. Domain = Process Improvement.
- **Job role**: A certain profession that covers part of the domain knowledge. E.g. Job role = Yellow Belt, Orange Belt, Green Belt or Black Belt.
- **Unit**: A list of certain activities that have to be carried out in the workplace. It is the top-level skill in the qualification standard hierarchy. Each unit consists of a number of elements.
- **Learning element**: Description of one distinct aspect of the work performed by a worker, either a specific task that the worker has to do or a specific way of working. Each element consists of a number of performance criteria.
- **Performance criteria**: Description of the minimum level of performance a participant must demonstrate in order to be assessed as competent.
- **Level of cognition**: For each performance criteria there is an intended level of cognition. At the same time this describes the complexity level of the test questions for each performance criteria, according Bloom’s Taxonomy – Rev. 2001.
2.3 Skill Set Structure

A skills hierarchy for the role ‘Lean Six Sigma Black Belt’ has been designed using the terminology outlined in the skills definition model and includes the skills identified during the demand analysis performed at the beginning of the project.

In the graph below you will find an example of the first four Skill Units and their Learning Elements. The first Learning Element of the first Skill Unit has three Performance Criteria, which are listed in the lower box. In total, the Lean Six Sigma skill set for the ‘Black Belt’ role is composed of 8 Units; 23 Learning Element and 94 Performance Criteria.
3 Green Belt for Service Skill Set

3.1 U1 – Enterprise-Wide Deployment

The Unit ‘Enterprise Wide Deployment’ discusses the general philosophy of Process Improvement. It handles the overview of different process improvement methods and the history of the most important methods: Lean and Six Sigma. It also explains why process improvement is needed, how it is organised and the different roles and responsibilities involved.

3.1.1 E1 – World Class Performance

The Learning Element ‘World Class Performance’ explains the history, value and principles of Lean and Six Sigma. Similarities and differences to other improvement methods are also reviewed.

<table>
<thead>
<tr>
<th>U1.E1.PC1</th>
<th>History of continuous improvement</th>
<th>Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe the origins of continuous improvement and its impact on other improvement models.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U1.E1.PC2</th>
<th>Value and foundations of Lean and Six Sigma</th>
<th>Understand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe the value of Six Sigma, its philosophy, history and goals. Describe the value of Lean, its philosophy and goals. Describe the relationship between Lean and Six Sigma.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U1.E1.PC3</th>
<th>Six Sigma and Lean applications</th>
<th>Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe how Lean and Six Sigma can be applied to processes in different types of enterprises (e.g. manufacturing, service, transactional, product and process design, innovation, construction)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U1.E1.PC4</th>
<th>Lean principles in the organisation</th>
<th>Understand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe the Toyota philosophy, the 14 principles and understand the impact of the Toyota Production System (TPS) on strategy, quality and production.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U1.E1.PC5</th>
<th>Business processes and systems</th>
<th>Understand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe the relationship among various business processes (design, production, purchasing, accounting, sales, etc.) and the impact these relationships can have on business systems.</td>
<td></td>
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</table>

3.1.2 E2 – Leadership

The Learning Element ‘Leadership’ explains the roles and responsibilities of the people involved in process improvement. The different Belt-levels and roles of management, team leaders and team members are also reviewed.

<table>
<thead>
<tr>
<th>U1.E2.PC1</th>
<th>Roles and responsibilities</th>
<th>Understand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe Six Sigma level of expertise: Master Black Belt, Black Belt, Green Belt, Orange Belt and Yellow Belt. Describe various team roles and responsibilities: Champion, Project leader, Supplier, User, Coach and Team member.</td>
<td></td>
</tr>
</tbody>
</table>
U1.E2.PC2  Change management  
Describe and use various techniques for facilitating and managing organizational and technical changes. Able to manage resistance to change.

U1.E2.PC3  Team performance, evaluation and reward  
Measure team progress in relation to goals, objectives and other metrics that support team success and reward and recognize the team for its accomplishments.

U1.E2.PC4  Organisational roadblocks  
Describe the impact an organization’s culture and inherent structure can have on the success of Lean Six Sigma and how deployment failure can result from the lack of resources or management support. Apply techniques to overcome these barriers.

3.1.3  E3 – Organisational Process Management
The Learning Element ‘Organisational Process Management’ explains the business perspective of process improvement such as business performance and financial measures, benchmarking and customer surveys. Project selection based on the above measures and project tracking is also reviewed.

U1.E3.PC1  Financial measures  
Define and use financial measures, including revenue growth, market share, margin, cost of poor quality (COPQ), net present value (NPV), return on investment (ROI) and cost-benefit analysis.

U1.E3.PC2  Business performance measures  
Able to communicate that employee and customer satisfaction and financial results have a positive influence on each other. Operational measures should be linked to corporate strategy.

U1.E3.PC4  Customer survey  
Identify and select the appropriate data collection method (e.g. surveys, focus groups, interviews and observation) to gather customer feedback to better understand customer needs, expectations and desires. Ensure that the instruments used are reviewed for validity and reliability to avoid introducing bias or ambiguity in the responses.

U1.E3.PC6  Project selection  
Understand project selection criteria. Able to select process improvement opportunities that meet these criteria best. Realize how individual projects meet higher level business goals and strategy.

U1.E3.PC7  Process elements  
Define and describe process components and boundaries. Recognize how processes cross various functional areas and the challenges that result for process improvement efforts.

U1.E3.PC8  Project tracking  
Understand how projects fit together with other projects. Able to follow multiple projects timing and progress.
3.2 U2 – Project Management

The Unit ‘Project Management’ outlines the way improvement projects should be executed. It covers the most common project management tools, the DMAIC improvement roadmap and team facilitation.

3.2.1 E1 – Project Management Tools

The Learning Element ‘Project Management Tools’ sets out the main elements that have to be taken into account during project execution, such as differing interests of stakeholders and project execution within time and budget.

U2.E1.PC1 Stakeholder analysis Apply
Identify process owners, internal and external customers and other stakeholders in a project. Understand different stakeholders have different goals.

U2.E1.PC2 DMAIC roadmap Apply
Understand and follow the Process Improvement DMAIC roadmap. Identify and select the proper tools to use during the Process Improvement project.

U2.E1.PC3 Time management Apply
Use project planning tools such as Gantt charts, critical path method (CPM). Attending meetings, arrive on-time, coming prepared. Be punctual and to the point. Able to define new actions.

U2.E1.PC4 Project risk analysis and mitigation Apply
Describe the purpose and benefit of project risk analysis. Attending risk assessment and assure useful contribution by identifying risks.

U2.E1.PC5 Project documentation Apply
Provide input and select the proper vehicle for presenting project documentation (e.g., spreadsheet output and storyboards) at phase reviews, tollgate reviews or management reviews.

3.2.2 E2 – Team Formation

The Learning Element ‘Team Formation’ discusses the various types of teams and the process for selecting team members.

U2.E2.PC1 Team member selection Understand
Understand the basic principles of team formation and team member selection.
3.2.3 E3 – Team Facilitation
The Learning Element ‘Team Facilitation’ discusses the dynamics that can occur during a project such as cooperation, resistance, escalation of problems and solving roadblocks.

U2.E3.PC1 Team dynamics and performance Understand
Know there are various techniques (e.g., coaching, mentoring and intervention) to overcome various challenges within group dynamics, including overbearing/dominant or reluctant participants, feuding and other forms of unproductive disagreements, unquestioned acceptance of opinions as facts, groupthink, floundering, rushing to accomplish or finish, digressions and tangents.

3.2.4 E4 – Communication
The Learning Element ‘Communication’ reviews the communication and decision making process within a team. The presentation of project progress is also reviewed.

U2.E4.PC1 Effective communication Apply
Use effective and appropriate communication for different situations to overcome barriers to project success.

U2.E4.PC2 Project Progress and presentation skills Apply
Prepare presentation and present project results to others. Describe objectives achieved and apply lessons learned to identify additional opportunities.

U2.E4.PC3 Decision making Apply
Apply brainstorming, nominal group technique and multi-voting.

3.3 U3 – Define
Define is the first phase within the DMAIC roadmap. The Unit ‘Define’ discusses the elements that have to be taken into account during the first phase of a process improvement project such as the project charter and customer requirement.

3.3.1 E1 – Voice of the Customer (VOC)
The Learning Element ‘Voice of the Customer’ reviews customer requirements (internal/external) and the flow down of these requirements to measurable criteria for the product and/or process.

U3.E1.PC1 Customer identification Apply
Show how the project will impact customers. Identify internal and external customers.
### U3.E1.PC2 Customer requirements
**Understand**
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).

### U3.E1.PC3 Customer demand
**Analyse**
Calculate customer takt time. Distinguish between takt time and cycle time.

### U3.E1.PC4 Critical requirements (CTx)
**Apply**
Define and describe various CTx requirements (critical to quality (CTQ), cost (CTC), process (CTP), safety (CTS) and delivery (CTD)) and the importance of aligning projects with those requirements.

### U3.E1.PC5 CTx Flowdown
**Apply**
Translate Voice of the customer (VOC) requirements into project goals and objectives. Translate objectives into CTx targets and specifications.

#### 3.3.2 E2 – Project Charter
The Element ‘Project Charter’ covers the description of the project such as problem description, objectives, scope, timing and benefits.

### U3.E2.PC1 Problem statement
**Create**
Develop and evaluate the problem statement in relation to customer requirements and business goals.

### U3.E2.PC2 Project scope and goal
**Analyse**
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).

### U3.E2.PC3 Project performance measures
**Analyse**
Assist with the development of performance measurements (Cost, Quality and Delivery) and establish key project metrics that relate to the voice of the customer.

### U3.E2.PC4 Project benefits calculation
**Analyse**
Define and calculate the hard benefits of the project and describe the soft benefits of the project.
3.4 U4 – Measure

Measure is the second phase within the DMAIC roadmap. The Unit ‘Measure’ describes the measurability of the process/product responses and factors of influence. The Unit also reviews several process mapping methods, types of data and the reliability of the measurement method. This Unit also discusses statistics and visualisation of data.

3.4.1 E1 – Process Mapping & Data Collection

The Learning Element ‘Process Mapping & Data Collection’ sets out the different ways of process mapping to visualise the process. This Element also covers types of data and the accuracy and integrity of data.

U4.E1.PC1 Input and output variables (SIPOC) Analyse
Identify input and output process variables and evaluate their relationships using PFM (Process Flow Mapping), SIPOC or Cause & Effect matrix.

U4.E1.PC2 Process flow modelling and metrics Analyse
Evaluate process flow and utilization to identify waste and constraints by analysing work in progress (WIP), work in queue (WIQ), touch time, takt time, cycle time and throughput.

U4.E1.PC3 Types of data Analyse
Define and classify qualitative and quantitative data, continuous (variables) and discrete (attributes) data and convert attributes data to variables measures when appropriate.

U4.E1.PC4 Sampling methods for ensuring data accuracy and integrity Apply
Define and apply methods for collecting data such as check sheets and coded data. Apply appropriate sampling methods (e.g. random sampling, stratified sampling and systematic sampling) that ensure the integrity of data.

U4.E1.PC5 Measurement scales Apply
Apply and analyse nominal, ordinal, interval and ratio measurement scales.

3.4.2 E2 – Statistics

The Learning Element ‘Statistics’ reviews the basics of statistics such as mean, deviation and probability. This Learning Element reviews a range of graphs that can be used to visualise data as well.

U4.E2.PC1 Basic terms Apply
Define and distinguish between population parameters and sample statistics (proportion, mean and standard deviation).
U4.E2.PC2 Visualisation of data Analyse
Construct and interpret diagrams and charts, including Pareto, Bar Chart, Pie Chart, Time Series Plot, Scatter Plot, Histogram, Box plot. Probability plot and Probability Distribution plot.

U4.E2.PC3 Commonly used distributions Understand
Understand and interpret Normal, Poisson and Binomial distributions.

U4.E2.PC4 Other distributions Remember
Know there are other distributions like exponential, lognormal and Weibull.

U4.E2.PC5 Descriptive statistics Analyse
Calculate and interpret measures of dispersion and central tendency and construct and interpret frequency distributions and cumulative frequency distributions.

U4.E2.PC6 Central limit theorem Apply
Describe and use the central limit theorem and apply the sampling distribution of the mean to inferential statistics for confidence intervals and control charts.

3.4.3 E3 – Measurement Systems
The Learning Element ‘Measurement Systems’ examines the reliability of the measurement system.

U4.E3.PC1 Measurement methods Remember
Recognize various measurement methods, and its specific characteristics and application opportunities.

U4.E3.PC2 Measurement systems analysis Apply
Understand the contribution of measurement system variation as part of total observed variation. Know how to execute a Measurement System Analysis and how to interpret the results.

U4.E3.PC3 Metrology Remember
Understand the essence and comprehensive of measuring aspects, such as measuring systems, data collection methods and variables vs. units.

U4.E3.PC4 Measurement systems in the enterprise Apply
Know how to use measuring techniques to evaluate enterprise indicators such as lead time, quality and cost.
3.4.4 E4 – Process Capability and Performance

U4.E4.PC1 Process performance metrics Analyse
Calculate process performance metrics such as percent defective, parts per million (PPM), defects per million opportunities (DPMO), defects per unit (DPU) and rolled throughput yield (RTY). Know the difference between a defect and a defective.

U4.E4.PC2 Process capability studies Apply
Describe and apply elements of designing and conducting process capability studies, including identifying characteristics and specifications, developing sampling plans and verifying stability.

U4.E4.PC3 Short-term and long-term capability Understand
Know there is a difference between long-term and short-term capability.

U4.E4.PC4 Process capability indices Apply
Define, select and calculate Cp and Cpk to assess process capability.

U4.E4.PC6 Process capability for attributes data Apply
Calculate the process capability and process sigma level for attributes data.

3.5 U5 – Analyse
Analyse is the third phase within the DMAIC roadmap. The Unit ‘Analyse’ reviews the analysis of current process performance. The different elements will review Risk Analysis, Root Cause Analysis, Waste Identification, Regression Analysis and Analysis of Variance.

3.5.1 E1 – Exploratory Data Analysis
The Learning Element ‘Exploratory Data Analysis’ describes the predictive models using regression techniques to determine the relation between factors on a response. This Learning Element also covers process performance metrics and the method for determining the capability of a process to meet specifications.

U5.E1.PC1 Regression analysis Apply
Understand linear regression and its statistical significance. Use regression models for estimation and prediction.

U5.E1.PC2 Correlation coefficient Understand
Interpret the correlation coefficient.

U5.E1.PC3 Analysis of variance (ANOVA) Apply
Define terms related to ANOVA and interpret their results and data plots.
3.5.2  E2 – Hypothesis Testing
The Learning Element ‘Hypothesis testing’ reviews test methods that are used to test a hypothesis. This Learning Element also discusses Confidence Intervals that indicate the reliability of test conclusions.

**U5.E2.PC1 Terminology**  
Apply  
Define and interpret the significance level, power, type I and type II errors in statistical tests.

**U5.E2.PC2 Statistical vs. practical significance**  
Apply  
Define, compare and interpret statistical and practical significance.

**U5.E2.PC3 Sample size**  
Apply  
Calculate sample size for common hypothesis tests (equality of means and equality of proportions).

**U5.E2.PC4 Point and interval estimates/Confidence Intervals**  
Apply  
Define and distinguish between confidence and prediction intervals. Define and interpret the efficiency and bias of estimators. Calculate tolerance and confidence intervals.

**U5.E2.PC5 Tests for means, variances and proportions**  
Apply  
Use and interpret the results of hypothesis tests for means, variances and proportions.

**U5.E2.PC6 Paired-comparison tests**  
Understand  
Define and describe paired-comparison parametric hypothesis tests.

**U5.E2.PC7 Goodness-of-fit (Chi square) tests**  
Analyse  
Define and interpret chi square and use it to determine statistical significance.

3.5.3  E3 – Analytical Methods
The Learning Element ‘Analytical Methods’ describes the tools that can be used for risk analysis, root cause analysis and waste identification.

**U5.E3.PC1 Failure mode and effects analysis (FMEA)**  
Analyse  
Describe the purpose and elements of FMEA, including the risk priority number (RPN) and evaluate FMEA results for processes, products and services.

**U5.E3.PC2 Root cause analysis**  
Evaluate  
Define and apply root cause analysis, recognize the issues involved in identifying a root cause. Apply problem solving process and tools (5-Why and Cause and Effect diagrams / Ishikawa) for analysing problems.
U5.E3.PC3 Waste identification Analyse
Identify and interpret the 8 classic types of waste for Manufacturing (Overproduction, Waiting, Transport, Overprocessing, Inventory, Movement, Defects, Unused expertise) and additional types of wastes for Service (missed opportunities and inefficient communications).

U5.E3.PC4 Value Stream Mapping (Current State) Analyse
Distinguish value added from non value added activities. Apply Value Stream Mapping to construct a Current State Map of the process to identify waste and non value added activities.

U5.E3.PCS5 Gap analysis Analyse
Use various tools and techniques (e.g. gap analysis and scenario planning) to compare the current and future state in terms of pre-defined metrics.

3.6 U6 – Improve

Improve is the fourth phase within the DMAIC roadmap. The Unit ‘Improve’ discusses the identification, implementation and verification of improvements that solve a problem, eliminate waste or improve quality or process performance.

3.6.1 E1 – Process Improvement Methods
The Learning Element ‘Process Improvement Methods’ sets out a series of methods and tools that can be used for process improvement, such as 5S, Kaizen, 8D, Theory of Constraints and Total Productive Maintenance.

U6.E1.PC1 Organised work environment (5S) Apply
Improve safety and moral. Organizing the work environment by applying 5S (Sort, Straighten, Shine, Standardize, Sustain).

U6.E1.PC2 Improvement teams (Kaizen) Apply
Able to facilitate improvement teams such as Kaizen or Small Group Activities.

U6.E1.PC4 Theory of constraints (TOC) Apply
Define and describe this concept and its uses. Identify bottle necks in the organization.
3.6.2 E2 – Waste Elimination
The Learning Element ‘Waste Elimination’ discusses improving the organisation of a production line or process. This Learning Element also explains line balancing, Flow, Pull, quick change-overs and doing things right the first time.

U6.E2.PC1 Value Stream Mapping (Future State) Apply
Define a Future state map using Value Stream Mapping to eliminate waste and reduce cycle time.

Calculate and distinguish takt time and cycle time. Create a balanced process flow by levelling both volume and product mix. Implement Pull systems to avoid overproduction.

U6.E2.PC4 First Time Right (FTR) Apply
Understand the process has to be stopped when there is a quality problem. Identify opportunities to apply Poka Yoke to avoid quality problems.

3.7 U7 – Control
Control is the fifth phase within the DMAIC roadmap. The Unit ‘Control’ is about sustaining achievements and discusses the tools and procedures that ensure good quality. The elements that are reviewed include Statistical Process Control, Visual Management, Standardisation and Documentation.

3.7.1 E1 – 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.

U7.E1.PC1 Objectives and benefits Understand
Understand the objectives and benefits of SPC.

U7.E1.PC2 Selection and application of control charts Understand
Understand the different types of control charts such as Xbar-R.

U7.E1.PC3 Control chart analysis Understand
Understand the difference between special cause and common cause variation.
3.7.2 E2 – Quality Assurance

The Learning Element ‘Quality Assurance’ establishes a series of tools and procedures that can be used to measure, communicate and ensure quality such as visual management and controls.

U7.E2.PC1 Visual Management Apply
Apply the elements of Visual management and describe how they can help to control the improved process.

U7.E2.PC2 Control plan Apply
Develop a control plan to document and hold gains. Define controls and monitoring systems.

3.7.3 E3 – Sustain Improvements

The ‘Sustain Improvements’ Learning Element discusses methods for maintaining achievements, becoming a learning organisation, standardisation and documentation.

U7.E3.PC1 Lessons learned Apply
Identify and document lessons learned from all phases of a project. Identify possible improvements and ownership.

U7.E3.PC2 Standardised work and Documentation Apply
Standardize tasks and processes to establish the foundation for continuous improvement. Develop or modify documents including standard operating procedures (SOPs) and work instructions to ensure that the improvements are sustained over time.

U7.E3.PC3 Training deployment Apply
Support in developing work environment skills.

U7.E3.PC4 On-going evaluation and auditing Evaluate
Apply tools for the on-going evaluation of the improved process, including auditing (internal / external), monitoring for new constraints and identification of additional opportunities for improvement.
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 [7].

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 [8]. Bloom’s Taxonomy divides educational objectives into three “domains”: Affective, Psychomotor and Cognitive. This Skill only notice the Cognitive domain.

The ‘Levels of Cognition’ are in rank order - from least complex to most complex.

Remember
Recall or recognise terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc.

Understand
Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

Apply
Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc.

Analyse
Break down information into its constituent parts and recognise their relationship to one another and how they are organised; identify sublevel factors or salient data from a complex scenario.

Evaluate
Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards.

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
Appendix B – European Qualifications Framework (EQF) for Job roles

The European Qualifications Framework (EQF) acts as a translation device to make national qualifications more readable across Europe, promoting workers’ and learners’ mobility between countries and facilitating their lifelong learning.

The core of the EQF are 'learning outcomes' which are eight reference levels describing what a learner knows, understands and is able to do. [8]

<table>
<thead>
<tr>
<th>Level</th>
<th>Knowledge</th>
<th>Belt level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Basic general knowledge</td>
<td>-</td>
</tr>
<tr>
<td>Level 2</td>
<td>Basic factual knowledge of a field of work or study</td>
<td>-</td>
</tr>
<tr>
<td>Level 3</td>
<td>Knowledge of facts, principles, processes and general concepts, in a field of work or study</td>
<td>-</td>
</tr>
<tr>
<td>Level 4</td>
<td>Factual and theoretical knowledge in broad contexts within a field of work or study</td>
<td>Lean Six Sigma Yellow Belt</td>
</tr>
<tr>
<td>Level 5</td>
<td>Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge</td>
<td>Lean Six Sigma Orange Belt</td>
</tr>
<tr>
<td>Level 6</td>
<td>Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles</td>
<td>Lean Six Sigma Green Belt</td>
</tr>
</tbody>
</table>
| Level 7 | • Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research  
• Critical awareness of knowledge issues in a field and at the interface between different fields | Lean Six Sigma Black Belt    |
| Level 8 | Knowledge at the most advanced frontier of a field of work or study and at the interface between fields | Lean Six Sigma Master Black Belt |
### Appendix B – Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APL</td>
<td>Accreditation of Prior Learning</td>
</tr>
<tr>
<td>ASQ</td>
<td>American Society of Quality</td>
</tr>
<tr>
<td>CREDIT</td>
<td>Accreditation of Skills via the Internet</td>
</tr>
<tr>
<td>YB</td>
<td>Lean Six Sigma Yellow Belt</td>
</tr>
<tr>
<td>OB</td>
<td>Lean Six Sigma Orange Belt</td>
</tr>
<tr>
<td>GB</td>
<td>Lean Six Sigma Green Belt</td>
</tr>
<tr>
<td>BB</td>
<td>Lean Six Sigma Black Belt</td>
</tr>
<tr>
<td>LSSA</td>
<td>Lean Six Sigma Academy, <a href="http://www.lssa.eu">www.lssa.eu</a></td>
</tr>
<tr>
<td>NVQ</td>
<td>National Vocational Qualification standard of England, Wales and N. Ireland</td>
</tr>
<tr>
<td>EQF</td>
<td>European Qualifications Framework</td>
</tr>
<tr>
<td>ECQA</td>
<td>European Certification and Qualification Association, <a href="http://www.ecqa.org">www.ecqa.org</a></td>
</tr>
</tbody>
</table>

The LSSA has developed an abbreviation list with over 200 Lean Six Sigma terms and abbreviations. It is available online in five different languages at [www.lssa.eu](http://www.lssa.eu).
Appendix C – References

[1]  CREDIT Project, Accreditation Model Definition, MM 1032 Project CREDIT, Version 2.0, University of Amsterdam, 15.2.99

[2]  DTI - Department of Trade and Industry UK, British Standards for Occupational Qualification, National Vocational Qualification Standards and Levels


It is important for businesses and organisations to continuously focus on customer satisfaction by supplying products or services with outstanding quality, cost efficiently and within the agreed lead time. Improving quality and efficiency is the domain of ‘Process Improvement’.

Realising these objectives is effectively achieved by applying Lean Six Sigma: a combination of Lean Manufacturing and Six Sigma approaches. Within Lean Six Sigma, individuals can be trained at various ‘Belt levels’. These levels are called Black Belt, Green Belt, Orange Belt and Yellow Belt.

The LSSA – Lean Six Sigma Academy – was established in September 2009, with the main objective to determine a common certification standard for Lean Six Sigma job roles. This has been realised by developing four skill sets with clear criteria and an online exam portal. This document describes the Green Belt for Service skill set.