
**Quantitative methods in process
improvement — Six Sigma —
Competencies for key personnel and
their organizations in relation to Six
Sigma and Lean implementation**

*Méthodes quantitatives pour l'amélioration des processus — Six
Sigma — Compétences pour le personnel clé et leur organisation en
relation avec la mise en œuvre du Six Sigma et du Lean*

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 7, *Applications of statistical and related techniques for the implementation of Six Sigma*.

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Introduction

This International Standard sets out to clarify the required competencies for personnel and organizations in Six Sigma¹⁾, Lean and “Lean & Six Sigma”. Because of the ambiguity of the many combinations of Lean and Six Sigma, currently termed “Lean Six Sigma”, this International Standard will use the term “Lean & Six Sigma”. Before this, there had been no universal standard on what constitutes a Black Belt or what is required in an organization which deploys these approaches.

For example, if an organization advertises for a Six Sigma Black Belt, how can they be sure of the level of ability of a “Black Belt”? If a supplier says it is deploying Six Sigma or perhaps Lean, how can a customer be sure of their real abilities? A fundamental purpose of this International Standard is to assist in the answer of such questions.

Much debate has been had on the nature of Six Sigma and Lean, their commonality and their differences. Protagonists have argued over the content, overlap, application, supremacy and purpose of the two approaches. Various combinations of the two approaches exist, many under the umbrella title of “Lean Six Sigma”. Six Sigma and Lean have a commonality of field of application, i.e. process improvement. Lean focuses on reducing ‘chronic’ waste and Six Sigma focuses on reducing the variation and thereby its adverse effects.

This International Standard therefore sets out the separate competency requirements for Six Sigma and Lean implementation; it also sets out a combined competency framework for “Lean & Six Sigma”. In so doing, it focuses on the competencies (skills and abilities) to deliver benefits to an organization rather than defining the specific educational level required for each role.

Candidates will be expected to demonstrate that they have an adequate level of competence, an amalgamation of education, training skills and experience necessary to fulfil their roles.

In its preparation, it has been seen to be helpful to prepare this International Standard by focusing on Six Sigma, Lean implementation and “Lean & Six Sigma” separately and the user will come across different tables dealing with these subjects.

1) Six Sigma is a trade mark of Motorola, Inc.

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Quantitative methods in process improvement — Six Sigma — Competencies for key personnel and their organizations in relation to Six Sigma and Lean implementation

1 Scope

This International Standard defines the competencies for the attainment of specific levels of competency with regards to Six Sigma, Lean, and “Lean & Six Sigma” in individuals, e.g. Black Belt, Green Belt and Lean practitioners and their organizations. Yellow Belt is not included in this International Standard. This International Standard excludes Design for Six Sigma.

NOTE This International Standard sets out the required competencies for individual certification and/or an organization’s certificate.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13053-1, *Quantitative methods in process improvement — Six Sigma — Part 1: DMAIC methodology*

ISO 13053-2, *Quantitative methods in process improvement — Six Sigma — Part 2: Tools and techniques*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

appropriate authority

authority identified and justified by an organization

Note 1 to entry: This authority can be either internal or external to the organization.

3.2 Abbreviated terms

5S	sort, set, shine, standardize, sustain
CT	critical to
DOWNTIME	defects, overproduction, waiting, non-utilization of talent, transport, inventory, motion, extra-processing
EDA	exploratory data analysis
HOQ	house of quality
OEE	overall equipment effectiveness
PDCA	plan, do, check, act

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PDM	policy deployment matrix
SIPOC	supplier-input-process-output-customer
SMED	single-minute exchange of die
TIM WOOD	transport, inventory, motion, waiting, over-processing, overproduction, defects
VOC	voice of the customer
VSM	value-stream map
WIP	work in progress
WORMPIT	waiting, overproduction, rework, motion, processing, inventory, transport

4 Competency of key personnel in relation to Six Sigma, Lean, and “Lean & Six Sigma”

4.1 Education and training

Six Sigma, Lean, and “Lean & Six Sigma” personnel shall be competent on the basis of adequate and appropriate education, training, skills, competencies and experience.

4.2 Skills and competency

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4.2.1 Six Sigma

See [Annex A](#).

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4.2.2 Lean

See [Annex B](#).

4.2.3 “Lean & Six Sigma”

See [Annex C](#).

4.3 Experience

Appropriate evidence of relevant experience of an individual shall be recorded, validated, controlled and maintained. Records shall be legible, readily identifiable and retrievable.

EXAMPLE A successfully completed Six Sigma project or parts of projects, Lean activities.

5 Adequacy of an organization with regards to its Six Sigma, Lean or “Lean & Six Sigma” approach and deployment

5.1 General

Within an organization, it will be important to have the role of a champion well-defined as per ISO 13053-1. A champion facilitates improvement activities and removes “road blocks” in the path of project completion.

The organization shall, at regular defined, justified intervals and in alignment with business objectives, review and adjust the Six Sigma, Lean or “Lean & Six Sigma” strategy by an appropriate authority.

It is expected that any audit will respect the confidentiality of the organization in all respects (to include, but not limited to, intellectual property, security and commercial issues).

5.2 Adequacy of the organization's Six Sigma, Lean or "Lean & Six Sigma" strategy

The organization shall

- a) define, maintain and control an appropriate, documented Six Sigma, Lean or "Lean & Six Sigma" strategy. This International Standard shall define the objectives of the approach and deployment. This will be part of the organization's overall strategy and can be a separate document, and
- b) define, maintain and control appropriate approaches and/or plans of action to achieve these objectives.

5.3 Adequacy of the organization's Six Sigma, Lean or "Lean & Six Sigma" architecture

The organization shall

- a) define, maintain and control Six Sigma, Lean or "Lean & Six Sigma" architecture appropriate to the organizational culture, to include infrastructure, steering committees, reporting structures, responsibilities/accountabilities, support,
- b) define, maintain and control appropriate numbers and disposition of Six Sigma, Lean or "Lean & Six Sigma" personnel, at appropriate competence levels (see ISO 13053-1), and
- c) define, maintain and control appropriate decision-making processes for the Six Sigma, Lean or "Lean & Six Sigma" approach and deployment.

5.4 Adequacy of the skills and competencies of the key personnel

The organization shall

- a) determine the necessary competencies for Six Sigma, Lean or "Lean & Six Sigma" personnel subject to the minimum competencies contained in this International Standard,
- b) where applicable, provide training or take other actions to achieve the necessary competence,
- c) maintain the competencies of its personnel at appropriate levels,
- d) evaluate the effectiveness of the actions taken,
- e) ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of their objectives, and
- f) maintain appropriate records of education, training, skills, competencies and experience.

5.5 Adequacy and continual improvement of organizational deployment

The organization shall

- a) define, maintain and control appropriate deployment metrics to ascertain the adequacy, or otherwise, of Six Sigma, Lean or "Lean & Six Sigma" deployment and its continual improvement,
- b) determine the required targets for these metrics,
- c) review the achievement against these targets, and
- d) review the continued relevance of the metrics and targets and update as appropriate.

6 Resource management

6.1 General

The organization shall define and identify key personnel.

6.2 Provision of resources

The organization shall determine, provide and effectively use the resources needed to

- a) support the Six Sigma, Lean or “Lean & Six Sigma” implementation, i.e. sponsor(s) and/or champion(s),
- b) deploy and maintain the Six Sigma, Lean or “Lean & Six Sigma” implementation and continually improve its effectiveness, and
- c) achieve their defined objectives.

NOTE These resources can be internal or external to the organization.

6.3 Ongoing monitoring of requirements

The organization shall, at regular defined intervals, review and adjust appropriate resources for the Six Sigma, Lean or “Lean & Six Sigma” measurement, analysis and improvement.

6.4 Key personnel

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Key personnel shall

- a) demonstrate attainment against defined competencies and objectives,
- b) actively maintain and enhance their skills and competencies, and
- c) actively maintain personal records of their training, skills, competencies and experience.

6.5 Maintaining competence of key personnel

6.5.1 Green Belts and Lean practitioners

Green Belts and Lean practitioners shall prepare and produce a portfolio of evidence of work experience. These portfolios form the basis of status review and will usually be reviewed internally every year by a Black Belt or Master Black Belt.

Status will be renewed subject to satisfactory evidence.

6.5.2 Black Belts and Lean leaders

Black Belts and Lean leaders shall prepare and produce a portfolio of evidence of work experience. These portfolios form the basis of status review and will normally be

- a) reviewed internally every year, and
- b) reviewed every three years by an appropriate authority.

Status will be renewed subject to satisfactory evidence.

6.5.3 Master Black Belt and Lean expert

Master Black Belts and Lean experts shall prepare a portfolio of evidence of work experience. These portfolios form the basis of status review and will normally be reviewed every three years by an appropriate authority.

Status will be renewed subject to satisfactory evidence.

6.6 Organization

The organization shall plan and implement the monitoring, measurement, analysis and improvement processes needed to

- a) demonstrate attainment of defined objectives and deployment metrics,
- b) ensure continued applicability of the approaches and/or plans of action, and
- c) enable organizational learning and continually improve the effectiveness of the implementation.

This shall include determination of applicable methods and justification of these methods to the appropriate authority, to include statistical techniques as appropriate and the extent of their use.

6.7 Maintaining competence of the organization

The competence of an organization is to be reviewed every three years by an appropriate authority.

More frequent internal reviews are recommended.

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Annex A (normative)

Six Sigma

A.1 Green Belt

The Green Belt is expected to deliver the agreed benefits of a Six Sigma project to the organization. These improvement activities will often be within the Green Belt's usual field of employment and operation. In so doing, the Green Belt will

- a) work with the local 'line management' to identify and quantify opportunities for improvement within the local environment,
- b) be required to
 - 1) work, possibly under the direction of a Black Belt or Master Black Belt or as a member of a larger Six Sigma project led, for example, by a Black Belt, and/or
 - 2) be required to lead a smaller Six Sigma project under the direction of a Black Belt, and
- c) possibly coach process operators (Yellow Belts) on process improvement methods and activities.

Table A.1 — Six Sigma — Green Belt competencies

Index	Competency	Performance criteria	Suggested evidence of understanding the competency	Suggested evidence of applying the competency	Suggested evidence of managing the competency	Suggested evidence of training the competency
1	Organizational benefits identification and prioritization.	Understands the importance of using quantified local organizational benefits or goals to guide project selection.	Describes the appropriate identification of the organization's opportunities, the benefits of removing concerns and the relationship to an organization's local business goals and how project/problem selection relates to these goals.	Demonstrates the identification of benefits on Green Belt projects.	Not applicable	Not applicable
2	Business process improvement.	Understands the use of Six Sigma to support organizational strategy.	Describes when and where Six Sigma would be an appropriate approach for process improvement in the organization.	Demonstrates the impact that Six Sigma has had on local organization.	Not applicable	Not applicable
3	Change management.	Understands the role of a Green Belt in change management and the importance of using a coherent approach to manage change.	Describes interaction between stakeholders and the change process in the Green Belt's project and the mutual impact of one on the other.	Demonstrates participation in and communication of change.	Not applicable	Not applicable

Table A.1 (continued)

Index	Competency	Performance criteria	Suggested evidence of understanding the competency	Suggested evidence of applying the competency	Suggested evidence of managing the competency	Suggested evidence of training the competency
4	Data acquisition for analysis.	Identifying and actively seeking appropriate information in various forms, ensuring the validity of such information and transforming into data which can be analysed in Competency 22.	Describes the difference between qualitative and quantitative information and the benefits of quantifying performance. Describe where data might be found, how it is gathered and what analysis techniques might be used in the Green Belt's project. Describe where or how validity might be compromised and what actions might be needed.	Evidence of implementation of a plan to acquire appropriate data.	Not applicable	Not applicable
5	Leadership development in self.	Importance of developing leadership skills in self.	Describes leadership development including the following, as appropriate: self-assessment, importance of coaching, importance of mentoring, personal development plans.	Not applicable	Not applicable	Not applicable
6	Leadership development in others.	Importance of leadership development in others. (See also Competency 20).	Not applicable	Not applicable	Not applicable	Not applicable
7	Creativity thinking.	Understands the need to apply creative thinking approaches to pursue project objectives.	Describes the different thinking modes (e.g. creative and analytical).	Evidence of use of this approach during a project.	Not applicable	Not applicable
8	Customer focus.	To understand how and why to listen to the 'voice of the customer' (VOC).	Describes the different types of customers as applied to the Green Belt project.	Demonstrates the application of 'customer focus' approaches. For example, through the correct use of a 'house of quality' and/or 'critical to' (CT) matrix.	Not applicable	Not applicable
9	Decision making and taking.	To recognize the importance of decision-taking and identify the decision-takers.	Describes circumstances where decision-taking is required in a Green Belt project and the responsibility for these decisions.	Not applicable	Not applicable	Not applicable
10	Interpersonal and team leadership skills.	To support effective interaction with others including stake holders. To work effectively with others to achieve objectives.	To know the factors affecting team effectiveness, including factors such as leadership style, team roles, personality types.	Demonstrates the effective use of communication techniques in a Green Belt project.	Not applicable	Not applicable