

### Overview

This unit covers the competences required for carrying out capability studies. It involves obtaining all the necessary data in order to carry out the study analysis, and determining the appropriate sample size using statistically based techniques. From the study, you will be required to produce statistical information, which will include calculating mean, mode, median, standard deviation, range, variance, and the capability indices  $C_p$  and  $C_{pk}$  for the process. You will also need to calculate the sigma score ( $Z$ ) from the  $C_{pk}$ , and the parts per million outside upper and lower specification limits for the processes studied, for both the long and short term.

You will be expected to analyse the information gained, and to identify activities which will improve the process capability. You will also need to present your findings in a process capability report, highlighting the improvements to be made and the actions to be taken.

Your responsibilities will require you to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the activities that you cannot solve, or that are outside your responsibility, to the relevant authority. You will need to ensure that all the necessary documentation is completed accurately and legibly. You will be expected to take full responsibility for your own actions within the activity, and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of capability studies, and will provide an informed approach to the techniques and procedures used. You will need to understand the principles and application for carrying out the capability studies, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

### Performance criteria

*You must be able to:*

- P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
- P2 obtain all the necessary data in order to carry out the capability study analysis
- P3 determine the appropriate sample size, using statistically based techniques
- P4 determine whether rational sub-grouping is appropriate
- P5 carry out the process capability study and produce relevant statistics
- P6 produce a histogram to represent the Cp and Cpk graphically
- P7 analyse the information gained and identify activities to improve the process capability
- P8 produce a process capability report, highlighting the improvements to be made and the actions to be taken

## Carrying out capability studies

---

### Knowledge and understanding

*You need to know and understand:*

- K1 the health and safety requirements of the area in which you are carrying out the capability studies
- K2 why we need to assess process capability, and how this affects a Six Sigma project
- K3 the meaning of the term 'sigma score' (Z)
- K4 how to calculate the sigma score (Z) and use this to estimate the percentage outside of specification
- K5 Cp and Cpk, and how are they calculated
- K6 how to calculate long-term capability from short term data
- K7 the number of samples needed for a statistically valid short-term capability study
- K8 the meaning of a 'population' and a 'sample'
- K9 how to select appropriate sample sizes
- K10 how to calculate parts per million
- K11 how to calculate mean, median, mode, standard deviation, range, and variance
- K12 how to perform rational sub-grouping
- K13 the extent of your own authority within the project, and to whom you should report in the event of problems that you cannot resolve

### **Additional Information**

**Scope/range  
related to  
performance  
criteria**

You must be able to:

1. carry out a capability study, which covers **both**:
  - 1.1. the short term
  - 1.2. the long term
2. calculate the following statistics:
  - 2.1. mean
  - 2.2. median
  - 2.3. mode
  - 2.4. standard deviation
  - 2.5. range
  - 2.6. variance
3. calculate the following from the above statistics:
  - 3.1. the capability indices  $C_p$  and  $C_{pk}$  for the process
  - 3.2. the sigma score ( $Z$ ) from the  $C_{pk}$
  - 3.3. the parts per million outside upper and lower specification limits for the processes studied

## SEMBIT3-26 - SQA Unit Code F9J2 04

### Carrying out capability studies

---

<b>Developed by</b>	SEMTA
<b>Version number</b>	1
<b>Date approved</b>	December 2008
<b>Indicative review date</b>	December 2013
<b>Validity</b>	Current
<b>Status</b>	Original
<b>Originating organisation</b>	SEMTA
<b>Original URN</b>	26
<b>Relevant occupations</b>	Business, Administration and Law; Associate Professionals and Technical Occupations; Business management; Business and Finance Associate Professionals
<b>Suite</b>	Business Improvement Techniques Suite 3 2008
<b>Key words</b>	Engineering, business, improvement, techniques, capability studies, process, Cp, Cpk