

SQA Advanced Unit Specification

General information for centres

Unit title: Value Engineering

Unit code: HV34 47

Unit purpose: This Unit has been designed to allow candidates' to develop the knowledge, understanding and skills to undertake Value Engineering techniques. This Unit has been written in a generic format and may, therefore, be used in any SQA Advanced award where Value Engineering techniques are considered relevant to the programme of study.

On completion of the Unit the candidate should be able to:

- 1 Explain Value Engineering techniques.
- 2 Apply Value Engineering to optimise the performance versus cost of a product or service.

Credit points and level: 1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: Entry is at the discretion of the centre however candidates should have good Communication and team working skills. This may be evidenced by possession of the following: SQA Advanced unit Communication: Practical Skills (HP4A 47) and the Working with Others Core Skill at SCQF level 5.

Core Skills: There are opportunities to develop the Core Skills of Written Communication, Oral Communication, Critical Thinking, Planning and Organisation, Review and Evaluation and Working with Others at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: Outcome 1 may be assessed by a closed book assessment paper lasting one-hour. Outcome 2 may be assessed by candidates undertaking a team based Value Engineering exercise and producing individual reports. An example instrument of assessment and marking guidelines has been produced to show the national standard of achievement at SCQF level 7.

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SQA Advanced Unit Specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain Value Engineering techniques

Knowledge and/or skills

- ◆ Process
- ◆ Applications
- ◆ Links to other quality management processes
- ◆ Functions
- ◆ Values
- ◆ Stages in Value Engineering process
- ◆ Reporting

Evidence Requirements

Evidence for the knowledge and/or skills items in Outcome 1 should be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown under the knowledge and/or skills items in the Outcomes. In any assessment of the Outcome **five out of seven** knowledge and/or skills items should be sampled.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ describe the overall Value Engineering process
- ◆ state three different areas in which Value Engineering can be applied
- ◆ explain any links Value Engineering may have to other quality management processes (eg TQM, lean practices, Six Sigma etc)
- ◆ explain what is meant by the term function in the context of Value Engineering
- ◆ explain what is meant by value in the context of Value Engineering
- ◆ explain the stages involved in implementing Value Engineering analysis
- ◆ state typical reports that are produced in connection with a Value Engineering study

Assessment should be conducted under controlled, supervised conditions. Assessment should be conducted under closed book conditions with candidates not being allowed to take any handouts, notes or textbooks into the assessment.

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Assessment guidelines

Assessment may take the form of a single assessment paper lasting one hour and taken at a single assessment event. The assessment paper should comprise of an appropriate balance of short answer and restricted response questions.

Outcome 2

Apply Value Engineering to optimise the performance versus cost of a product or service

Knowledge and/or skills

- ◆ Functional analysis
- ◆ Customer requirements
- ◆ High cost areas
- ◆ Team based creative thinking
- ◆ Analysis
- ◆ Decision making
- ◆ Reporting

Evidence Requirements

All knowledge and/or skills items in this Outcome should be assessed.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Convert the product or service to functions
- ◆ Link functional elements to customer requirements
- ◆ Gather information and undertake analysis that will allow the identification of high cost and redundant elements in the product or service
- ◆ Use team based creative thinking processes to
 - identify potential alternative solutions to replace high cost elements without any reductions in the quality, reliability or safety of the product or service
 - categorises potential alternative solutions into viable or non-viable
- ◆ Undertake analysis on viable alternative solutions to identify and agree the 'best' solution
- ◆ Present 'best' alternative solution(s) for consideration by appropriate persons

Assessment evidence should be generated by candidates undertaking a team based Value Engineering exercise and producing individual reports covering the knowledge and/or skills items shown above. Candidates should produce their reports in the own time. Centres should make every reasonable effort to ensure that reports are candidates' own work. Where copying or plagiarism is suspected candidates may be interviewed to check their knowledge and understanding of the subject matter. A checklist should be used to record oral evidence of the candidate's knowledge and understanding.

While working with others is an important aspect of Value Engineering, team working skills should not be formally assessed as part of the assessment of this Outcome.

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Assessment guidelines

Centres may specify to candidates the product or service they wish them to apply Value Engineering techniques to, or may leave it to candidates to decide which product or service they wish to analyse. For assessment purposes the customer may be someone employed in a business organisation or a member of centre staff.

As candidates are likely to be new to Value Engineering it is recommended that a lecturer acts as the facilitator while the team of candidates undertake team based creative thinking processes. In the role of facilitator the lecturer should be well placed to focus the group's efforts, stimulate the team and ensure all members of the team are involved.

Centres may also specify the role each candidate has in the team (eg designer, manufacturing engineer, procurement specialist etc) or leave it to candidates to decide which roles they wish to assume.

Centres may choose to undertake an informal assessment of candidate team working skills. This may be done by observation by a lecturer, or lecturers, or by some form of peer group process or by a combination of the two.

Centres may wish to allow a member of the team, chosen by team members, to give a short presentation on the 'best' alternative solution(s) to an appropriate audience. As part of this presentation centres may also include a short question and answer session.

Reports should normally be between 1,000 and 1,200 words in length plus any diagrams and appendices. Centres may provide candidates with a format for the report or leave it to candidates to develop their own format.

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Administrative Information

Unit code:	HV34 47
Unit title:	Value Engineering
Superclass category:	VD
Original date of publication:	November 2017
Version:	01

History of Changes:

Version	Description of change	Date

Source: SQA

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SQA Advanced Unit Specification: support notes

Unit title: Value Engineering

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit has been written in order to allow candidates to develop their knowledge, understanding and skills in the following areas:

- 1 Explaining Value Engineering techniques.
- 2 Applying Value Engineering to optimise the performance versus cost of a product or service.

This Unit was originally developed for the SQA Advanced Certificate in Engineering Practice but has been written in a generic format so that it can be used in any SQA Advanced award where Value Engineering techniques are considered relevant to the programme of study. The Unit can also be offered on a free standing basis.

Value Engineering is also frequently called Value Management and Value Analysis.

There are a number of different definitions of Value Engineering. A typical definition may be of the following form, 'a professionally applied, function-oriented, systematic team approach used to analyse and improve value in a product, design, system or service—a powerful methodology for solving problems and/or reducing costs while improving performance/quality requirements.'

Value Engineering can be applied in a business or economic context, including by government, and in engineering, construction and service industries. It can be applied to hardware and software, development, specifications, standards and contract requirements.

Functions should describe what an item of equipment does, rather than what it is. Any statement on a function must be expressed as a **verb** followed by a **noun**, eg transfers heat, removes liquid. There are normally considered to be two types of functions: (1) basic functions, project specific and (2) constant functions which apply to all projects, eg make money, improve safety.

The concept of value is central to Value Engineering. Different approaches are taken to the concept. For example, the following types of value have been identified:

Use value relates to the features of a product or service which allows it to perform its function.

Cost value — represents the total cost of producing the product or service

Esteem value — is the additional price that a product or services attracts because of its inherent attractiveness to the buyer

Exchange value is the sum of all the attributes which allows the product or service to be exchanged or sold.

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The relative size of these different values will vary between different products or services and even over the life cycle of a product or service. Value Engineering seeks to identify the contribution of each feature to each type of value through systematic analysis and structured creative thinking techniques.

Lawrence Miles has provides some in-depth analysis on values in his text, ‘Techniques of Value Analysis and Engineering.’

The precise stages in a Value Engineering process varies from organisation to organisation. Typical stages may be as follows:

Pre-Exercise

- ◆ Planning

VE Exercise/Study

- ◆ Functional analysis
- ◆ Creative thinking
- ◆ Evaluation
- ◆ Refinement

Post-Exercise

- ◆ Evaluation Studies
- ◆ Study Report

The creative thinking phase is normally done as a team based approach using brainstorming or some similar technique. Pareto analysis is sometimes used to priorities those parts of the product or service which are most worthy of attention.

Documentation associated with a Value Engineering study varies from organisation to organisation but is likely to include documentation associated with the planning stage and a final study report.

Guidance on the delivery and assessment of this Unit

Unit delivery should involve an appropriate blend of lecturing, group work, role play, case studies and investigative work. Centres may use different forms of presentation materials such as Power point presentations, videos and DVDs to exemplify certain areas of the Unit. Centres may also choose to invite guest speakers to deliver some specialist areas of the Unit.

Centres should encourage candidates to read extensively on Value Engineering. There are a wide range of good materials available on the Internet on Value Engineering which candidates should be encouraged to investigate.

Candidates should be encouraged to work in groups during both the delivery and assessment of the Unit so that they can understand at first hand how team working may operate in practice. Such team working may also help candidates to develop their Oral Communication and Working with Others Core Skills.

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Lecturers should also challenge candidates thinking on the range of Value Engineering issues covered in this Unit, asking questions and suggesting alternative approaches where appropriate. This approach should help to develop candidates' Critical Thinking skills. Candidates should have opportunities to develop their Planning and Organisation and Review and Evaluation Core skills while undertaking the Value Engineering study in Outcome 2. They should also have opportunities to develop their Written Communication Core Skills while preparing Value Engineering documentation as part of the study in Outcome 2.

Information on Evidence requirements and Assessment guidelines is given in Outcomes 1 and 2 of the SQA Advanced Unit specification: statement of standards section. The assessment paper for Outcome 1 should be taken after the Outcome has been completed and the Value Engineering study should take place during the delivery of Outcome 2.

Opportunities for developing Core Skills

There are opportunities to develop the Core Skills of Written Communication, Oral Communication, Critical Thinking, Planning and Organisation, Review and Evaluation and Working with Others at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. However, with regards to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangements would be required to be put in place to ensure that the assessment paper for Outcome 1 is conducted under controlled, supervised conditions. Likewise centres are required to ensure that parts of the Value Engineering study in Outcome 2 are undertaken as a team based exercise.

To keep administrative arrangements to a minimum, it is recommended that for distance learning candidates each assessment paper is taken at a single assessment event.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

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General information for candidates

Unit title: Value Engineering

Value Engineering is a very important technique for reducing the cost of a product or service while retaining the quality, reliability and safety of the product or service. Value Engineering techniques can be applied in a range of different organisations in government, engineering, construction and service industries.

During the delivery of this Unit you will learn what Value Engineering is, how it is conducted, what the outcomes of a Value Engineering study are likely to be and how the outcomes can be used to influence the design or production of a product or service. It is likely that the Unit will be delivered by a balance of lectures, group work, role plays, case studies and investigation. The Internet contains a great deal of information on Value Engineering and it is likely that your lecturer will encourage you to explore the web to access this information.

Assessment for the Unit is likely to comprise of a one hour assessment paper covering the content of Outcome 1 and a team based Value Engineering study in which you will be expected to write up an individual report to cover the knowledge and/or skills items in Outcome 2.