

# **Unit 4017:** Quality and Process Improvement

**Unit Code:** Y/651/0734

**Level:** 4

**Credits:** 15

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## **Introduction**

Quality has always been the key to business success and survivability, but it requires organisations to allocate a lot of effort and resources to achieve it. The key to providing quality services and designing top quality products lies in the strength and effectiveness of the processes used in their development; processes which must be constantly reviewed to ensure they operate as efficiently, economically and as safely as possible.

This unit introduces students to the importance of quality assurance processes in a manufacturing or service environment and the principles and theories that underpin them. Topics included in this unit are: tools and techniques used to support quality control, attributes and variables, testing processes, costing modules, the importance of qualifying the costs related to quality, international standards for management (ISO 9000, 14000, 18000), European Foundation for Quality Management (EFQM), principles, tools and techniques of Total Quality Management (TQM) and implementation of Six Sigma.

On successful completion of this unit students will be able to illustrate the processes and applications of statistical process, explain the quality control tools used to apply costing techniques, identify the standards expected in the engineering environment to improve efficiency and examine how the concept of Total Quality Management and continuous improvement underpins modern manufacturing and service environments.

## **Learning Outcomes**

By the end of this unit students will be able to:

- LO1 Examine the applications of statistical process control when applied in an industrial environment to improve efficiency
- LO2 Analyse cost effective quality control tools
- LO3 Determine the role of standards in improving efficiency, meeting customer requirements and opening up new opportunities for trade
- LO4 Analyse the importance of Total Quality Management and continuous improvement in manufacturing and service environments.

## **Essential Content**

### **LO1 Examine the applications of statistical process control when applied in an industrial environment to improve efficiency**

*Quality control:*

The tools and techniques used to support quality control

Attributes and variables

Testing processes

Quality tools and techniques, including statistical process control (SPC), measurement of variables (such as dimensions, weight, signal, temperature, time,) testing (such as non-destructive and destructive).

Designing quality into new products and processes using Quality Function Deployment (QFD), and enhance quality in managing and monitoring supplier performance

Quality assurance: Principles and levels of quality assurance, systems, and operational consideration. Importance of accurate record keeping and monitoring of activities.

### **LO2 Analyse cost effective quality control tools**

*Quality costing:*

Costing modules (including budgeting, forecasting and control of direct and indirect costs, fixed and variable costs including actual, accrued and committed costs), analysis and interpretation of data and information

The importance of qualifying the costs related to quality Documentation such as Parts Per Million (PPM) quality adherence, cost analysis and test data

How costs can be used to improve business performance including achieving sustainability objectives.

### **LO3 Determine the role of standards in improving efficiency, meeting customer requirements and opening up new opportunities for trade**

*Standards for efficiency:*

The history of standards

The role of standards and their importance in enabling and supporting trade, business and industry; ethical usage of standards and implications

Standards for measurement

International Standards for management: purpose and internal governance arrangements to ensure compliance; relevant standards (ISO 9000, ISO 9001, ISO 14000, ISO 14001, ISO 18000, AS9100, TS16949 etc.)

European Foundation for Quality Management (EFQM) as an aid to developing strategic competitive advantage

Organisation context: Importance and use of organisations approved Standard Operating Procedures (SOP's), documentation recording systems and quality control, risk assessment, and the potential implications on safety, quality and delivery if they are not adhered to.

#### **LO4 Analyse the importance of Total Quality Management and continuous improvement in manufacturing and service environments**

*Overview and function of quality:*

The importance of quality to industry: how it underpins the ability to improve efficiency, meet customer requirements and improve competitiveness, cost of poor quality.

Principles, tools and techniques of Total Quality Management (TQM)

Advancements in TQM, KPIs and TQM.

Tools for improving quality and delivery. Advanced Product Quality Planning (APQP). Types of faults/defects recorded and analysed to improve future performance. Root Cause Analysis (RCA), Failure Mode and Effects Analysis (FMEA), Fishbone, Practical Problem Solving (PPS), Process Failure Mode and Effects Analysis (PFMEA). Tools for data collection and analysis, e.g., automatic test equipment, visual automatic inspection system, data acquisition equipment, software to analyse the data and inform operators in real time. Tools and techniques associated with lean manufacturing and process improvement such as Six Sigma, Kaizen, 8 Wastes. Workplace organisation such as 5S's (sort, set in order, shine, standardise and sustain), continuous flow, Poke Yoke (error proofing), 5 Whys (Root Cause Analysis), kanban (pull System), just-in-time (JIT), lean simulation activities, value stream mapping, total Preventive Maintenance Plan-do-check-act (PDCA), Single Minute Exchange of Die (SMED), A3 Reporting. Other lean operational and quality enhancement practices (e.g., visual management, waste reduction and shop floor problem solving).

Selecting the most appropriate tool/technique to solve a problem (including problem analysis models such as Is/Is Not).

## Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
	<b>LO1</b> Examine the applications of statistical process control when applied in an industrial environment to improve efficiency	
<b>P1</b> Review the tools and techniques used to support quality control.  <b>P2</b> Examine the processes and applications of statistical process control in a production environment.	<b>M1</b> Explain the role and effectiveness of the quality tools and techniques used within an industrial environment.	<b>D1</b> Suggest justified recommendations for the application of statistical process control in an industrial environment to improve efficiency.
	<b>LO2</b> Analyse cost effective quality control tools	
<b>P3</b> Analyse the effective use of quality control tools and techniques.  <b>P4</b> Compare costing techniques used within industrial environments.	<b>M2</b> Determine with justification the quality control tools and techniques that could be used to improve business performance.	<b>D2</b> Develop a process for the application of an extensive range of quality control tools and techniques, with emphasis on costing.

<b>Pass</b>	<b>Merit</b>	<b>Distinction</b>
<b>LO3</b> Determine the role of standards in improving efficiency, meeting customer requirements and opening up new opportunities for trade		
<b>P5</b> Determine required standards to improve efficiency, meet customer requirements and open up new opportunities for trade.	<b>M3</b> Discuss the importance of standards applied in the engineering environment.	<b>D3</b> Illustrate a plan for the application of international standards that would improve efficiency, meet customer requirements and open up new opportunities for trade.
<b>LO4</b> Analyse the importance of Total Quality Management and continuous improvement in manufacturing and service environments		
<b>P6</b> Contrast the principles, tools and techniques of Total Quality Management and continuous improvement.  <b>P7</b> Analyse how the concept of Total Quality Management and continuous improvement could help in delivering high quality performance within businesses.	<b>M4</b> Discuss how the appropriate application of Total Quality Management and continuous improvement in tools and techniques affect quality performance in the manufacturing and service environments.	<b>D4</b> Evaluate how the appropriate application of total quality management and continuous improvement in tools and techniques affect quality performance in the manufacturing and service environments.

## **Recommended Resources**

Note: See *HN Global* for guidance on additional resources.

### **Print Resources**

- Amsden R.T. (2019). *SPC simplified: Practical steps to quality*. Routledge.
- Begum S., Rajendran C., Prakash Sai L., Ganesh K. and Mohapatra S. (2021) *Total Quality Management in Higher Education: Study of Engineering Institutions*. 1st Edition. Routledge India.
- Cachon G. and Terwiesch C. (2023) *Operations Management*. 3rd Edition. McGraw-Hill
- Cottmon R.J. (2020) *Total Engineering Quality Management*. 1st Edition. CRC Press.
- Goetsch D.L. and Davis S. (2021) *Quality Management for Organizational Excellence: Introduction to Total Quality*. 9th edition. Pearson.
- Lim J.S. (2020) *Quality Management in Engineering: A Scientific and Systematic Approach*. 1st Edition. CRC Press.
- Mathur S. (2021) *Book Review of Total Quality Management in Education. Management Dynamics*.
- Montgomery D.C. (2019) *Introduction to statistical quality control*. John Wiley & sons.
- Stevenson W.J (2021) *Operations Management*. 14th Edition. McGraw-Hill.
- Slack, N., Chambers, S. and Johnston, R. (2016) *Operations Management*. 8th Ed. Essex: Pearson Education Limited.

### **Journals**

Note: Example journals listed below provide a broad range of articles related to unit content and those relevant for the qualification. Staff and students are encouraged to explore these journals and any other suitable journals to support the development of academic study skills, and subject specific knowledge and skills as part of unit level delivery.

[Journal of Quality in Maintenance Engineering](#)

[The TQM Journal](#)

[Quality Management Journal](#)

### **Links**

This unit links to the following related units:

*Unit 5016: Lean Manufacturing*