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Guide to the economics of quality —

Part 1: Process cost model

Committees responsible for this British Standard

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Foreword

This Part of BS 6143 has been prepared under the direction of the Quality, Management and Statistics Standards Policy Committee.

This Part of BS 6143, together with BS 6143-2:1990, is an extensive revision and expansion of BS 6143:1981, which was withdrawn upon publication of BS 6143-2.

BS 6143-1, the process cost model, sets out a method for applying quality costing to any process or service. It recognizes the importance of process measurement and process ownership. The categories of quality costs have been rationalized to the cost of conformance and the cost of nonconformance. This serves to simplify classification. The method depends on the use of process modelling and the standard gives guidelines on useful techniques. The application of the process control model is compatible within the concept of total quality management.

BS 6143-2, the prevention, appraisal and failure model, is a revised version of the traditional method of product quality costing in manufacturing industries.

Improvements have been made in the light of experience and it is recognized that successful practitioners may wish to continue with this approach. Continuation of this approach does not preclude the simultaneous development of the process cost model.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

0 Introduction

Total quality management (TQM) requires the management of processes, not just of outputs. This is fundamental to improving quality and productivity in manufacture and service enterprises alike. Every person within the organization contributes to and operates within a process, and every process should have an identified process owner who is responsible for the effectiveness of that process.

Historically, the concept of a quality cost model has suggested that certain identifiable costs are in some way related to the “quality” of the end result. By contrast, within the TQM culture, all business activity is related to processes and therefore the cost model should reflect the total costs of each process rather than an arbitrarily defined cost of quality.

The only partitioning which is ultimately valid is that between the costs of conformance to requirements and the costs of nonconformance. Both are usually capable of improvement. The “process” may be considered at any level within the organization, e.g. the process may be a particular work stage, or it may be the overall process of operating the business. In either case, the process uses materials and resources and the process owner, whether an individual, a supervisor or the managing director, needs the facility to monitor the costs of that process and take action to ensure that these are minimized.

NOTE A new standard guide to total quality management is being prepared as a revision of BS 4891.

1 Scope

This Part of BS 6143 provides guidance on the modelling and determination of costs associated within any business process in a manner consistent with the pursuit of continuous improvement and the concept of total quality management.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 6143 the definitions given in BS 4778 apply, together with the following.

2.1

quality related cost

cost in such categories as: prevention cost; appraisal cost; internal failure cost; and external failure cost

NOTE These categories are individually defined in BS 6143-2.

2.2

cost of conformance (COC)

the intrinsic cost of providing products or services to declared standards by a given, specified process in a fully effective manner

2.3

cost of nonconformance (CONC)

the cost of wasted time, materials and capacity (resources) associated with a process in the receipt, production, despatch and correction of unsatisfactory goods and services

2.4

process cost

the total cost of conformance and cost of nonconformance for a particular process

2.5

process

any activity that transforms inputs into outputs, utilizing resources and being subject to particular controls

NOTE Inputs, controls and resources are all supplied to the process.

2.6

inputs

materials and/or data that are transformed by the process to create outputs

2.7

outputs

the result of the transformation of inputs

NOTE In practice the outputs include:

- a) that which conforms to the requirement;
- b) that which does not conform;
- c) waste;
- d) process information.

2.8

controls

inputs that define, regulate and/or influence the process

NOTE Controls embrace procedures, methods, plans, standards policies, strategy and legislation.

2.9

resources

contributing factors which are not transformed to become an output

NOTE Examples of resources include people (individuals or groups), equipment, material, accommodation and environmental requirements.

2.10

process owner

the individual who has full responsibility for and authority over the process

2.11

synthetic cost

a cost, derived from available relevant data on a clearly established basis

NOTE An example of a synthetic cost is hours worked $\times$ labour rate.

2.12

environment

the external and internal conditions that influence the existence, development and performance of the process

3 The process cost model

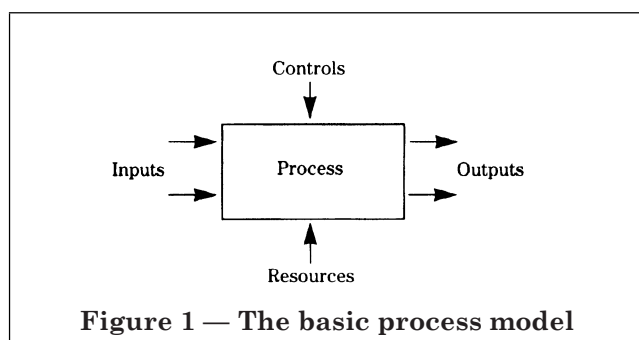
3.1 The process

Total quality management (TQM) requires the management of processes, not just of outputs. This is fundamental to improving quality and productivity in manufacture and service enterprise alike. Every person within the organization contributes to and operates within a process, and every process should have an identified process owner, who is responsible for the effectiveness of that process.

3.2 Identification of inputs, outputs, controls and resources

It is useful to construct a block diagram to identify all the elements of the process. It also focuses attention on the need for the process.

The process model should be prepared essentially as shown in Figure 1 and examples of more complex process models are shown in appendix A.



3.3 The process cost elements

Cost elements associated with the process can be identified and recorded under one of the following categories:

- a) people;
- b) equipment;
- c) materials;
- d) environment.

Each individual cost element also needs to be identified as a cost of conformance and/or a cost of nonconformance and the source of the data recorded.

1) **Cost of conformance (COC)**. The cost of operating the process as specified in a 100 % effective manner. This does not imply that it is an efficient, nor even a necessary process, but rather that the process, when operated within its specified procedures, cannot be achieved at a lower cost. This is the minimum cost for the process as specified.

2) **Cost of nonconformance (CONC)**. The cost of inefficiency within the specified process, i.e. over resourcing of excess costs of people, materials and equipment arising from unsatisfactory inputs, errors made, rejected outputs and various other modes of waste. These are considered non-essential process costs.

Both areas of cost offer opportunities for improvement.

An operator within a process can usually influence directly only the cost of nonconformance, but he can recommend to the process owner changes that may ultimately affect the cost of conformance.

The owner of the process should monitor the process and make changes that will impact on both parts of the process cost. Some processes exist only because of nonconformance elsewhere, and the need for them may vanish if that nonconformance is removed.

3.4 Preparation of the process cost model

The cost model may be generated for any process within the organization. It may be used to identify and monitor process costs within one particular aspect of the organization such as an invoicing system, works order distribution system or the recruitment process. Alternatively, it may be used to monitor the overall cost e.g. of a department. Examples of cost models are given in appendix B.

The cost model is constructed by identifying all of the key activities to be monitored and listing them as either COC or CONC. The source of the data should also be identified. Ideally, this source of data should be from information already collated within the finance function. In some instances, however, it may be necessary to generate synthetic cost data. This is acceptable within the model, provided the assumptions are clearly stated.

Careful setting up of the cost model is critical to the success of the technique and is the first task of the process owner. Once set up, the model is used for regular reporting on performance. In order to achieve this, the model needs to remain stable to allow comparison with previous periods to be made and cost trends to be monitored. The choice of key activity parameters to be recorded is therefore of paramount importance.

The model should be reviewed early in its use to ensure its effectiveness and thereafter periodically for continued effectiveness.

3.5 Using the model

3.5.1 Teams

It is advisable that quality improvement teams be formed to review particular aspects or processes of the organization. These teams should be encouraged to prepare a process cost model and use this initially in the data collection and analysis phase, identifying opportunities to be investigated, and subsequently during the monitoring phase, in order to report on the improvements achieved.

3.5.2 Identify process

The process should be identified and isolated as a discrete set of activities and given a name. The owner should be identified. The outputs from the process should be identified and each output should be recognized as going to one or more customers. In general, a customer will be the owner of another process.

The inputs to a process should be identified, such as material and data. The controls and resources should also be identified.

3.5.3 Identify costs

Each process will contain a number of key activities. These should be identified. The cost of conformance and cost of nonconformance elements for each activity should be identified and established.

3.5.4 Cost report

The organization should adopt a uniform format for the cost report. The report should contain a complete list of the costs of conformance and nonconformance elements, and should specify:

- a) identification of all inputs, outputs, controls and resources of the process being considered;
- b) whether actual or synthetic costs are used;
- c) the means of calculation for each element of cost;
- d) the source of cost data.

The source of data may be an actual cost or a synthetic cost and this information should also be recorded, i.e.

actual cost:	a cost required by the financial system of the organization to be separately identified and recorded;
synthetic cost:	a cost not separately identified and recorded as an actual cost, but derived from available relevant data on a clearly established basis, e.g. hours taken to complete task × hourly rate.

Examples of cost reports are given in appendix C.

3.5.5 Improvement process

A programme of quality improvement activities should be planned, on the basis of information contained in the report, and priorities established. The process owner should consider iterative cycles of improvement using teams or individuals and monitor the resultant cost changes.

From consideration of the initial balance of cost of conformance (COC) and cost of nonconformance (CONC), decisions may be made as to whether the process design or the elimination of waste is the first priority. After improvements have been made, the balance may shift and attention move to the other aspect, this alteration continuing unless other areas of the balance offer greater scope for improvements and returns.

4 Relationship between the traditional (PAF) quality and process cost approaches

In the traditional approach to quality cost modelling, much time is expended in identifying and categorizing costs as prevention, appraisal and failure (PAF). Such categorization may be difficult and unsatisfactory for several reasons, e.g. as follows:

- a) Many of the costs can be justified as fitting into any one of the three categories. For example, design reviews may be considered to be a prevention cost; however, they are essentially a checking stage and, as such, could be considered an appraisal cost; but having been introduced to trap design faults at an earlier stage than might otherwise result, they could be considered a failure cost.