

FITNESS FOR PURPOSE

THE CORNERSTONE OF QUALITY MANAGEMENT

BY

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Customer Satisfaction

In the past the cornerstone was the first stone laid and if pulled away the whole building would collapse. Fitness for purpose, or customer satisfaction as I prefer to call it, is the base on which companies thrive or fall, but it cannot

be claimed that lack of it will bring them crashing down, because some contractors have for many years been supplying goods to the minimum possible standard that they can get away with. Their rule has been *caveat emptor* (let the buyer beware). The manufacturer produced and the customer, if big enough, did his best to protect himself against the receipt of non-conforming material.

To be fair to both sides *caveat emptor* requires near equality of product knowledge by the customer as well as the supplier, and for the small purchaser this is obviously quite impossible. In fact, in this rapidly advancing technological era, when equipment is becoming so complex and the cost of failure astronomical, even the pretence that the ordinary customer can purchase with comparable knowledge is being abandoned. Consumers are beginning to look around for protection; hence the rise of the Ralph Nader organization, Consumer Councils and so forth. Fundamentally these organizations can, in the end, only lead to an increase in cost which, for increased reliability, safety and general satisfaction, many customers are prepared to pay. How much more sensible it would be therefore if industry, without waiting for the growth of more consumer protection organizations, declares its intent to give customer satisfaction, not only on the day of purchase but throughout the life of the equipment. In this field there should be an intensive campaign to make consumers aware of the fact that the cost of ownership of cheap equipment is often more than that of a well-engineered reliable product where the cost of acquisition is higher.

One dismisses too lightly the fact that maintenance engineering probably has to last from 10 to 20 years after the other activities have ceased. It always appears to be a paradox of human nature that while the individual is only too keen to learn from his mistakes, collectively it appears that he does not even want to know what they are. One wonders how often car designers tap the vast knowledge available among the maintenance engineers in garages, or how many manufacturers invite their customers to inform them of equipment failures. Maybe there is a case for the institution of a museum of poor designs that have killed.

The public is of course protected by the Sale of Goods Act 1893; but who is going to take legal action when the kettle will not boil, the leaf sweeper does not sweep, and the mower does not cut? So the purchaser prefers the express warranty of the manufacturer which invariably limits his right in law.

Quality

Successive governments have ground into all of us that if we want an increase in real wealth we must keep the balance of payments in our favour. There has been surprisingly little written about what happens to the imports of raw materials that we buy. How much becomes scrap and reject through lack of quality procedures in manufacturing? Undoubtedly a fairly substantial reduction in the cost of imports would arise if each firm were to list more carefully their 'lack of quality' costs, such as scrap, reject, investment lock-up due to delays, warranty costs and so on. Also, a study of the figures shows that we are exporting successfully a large volume of low value goods, but high cost equipment sold overseas is at present low. This is an ominous sign!

The qualities that any customer is looking for are:

- (a) Fitness for the purpose for which the product is required.
- (b) Price.
- (c) Delivery.
- (d) Value, which is the quality and reliability you get for the price paid.

There is no doubt that advertising and the law of supply and demand can distort the picture in the short term, but in the long term these factors determine

the success or failure of any company. Fitness for purpose is effected by two main considerations:

- (a) Determining the standard of quality and reliability requisite to the product, taking into consideration its function and price;
- (b) Ensuring that these standards are maintained in all phases of activity from design to after-sales service.

One hears a lot today about lack of quality. In fact quality has been improving in almost anything you like to name from washing machines to television sets to motor cars, but the world has become so dependent on the products of the technological age that we cannot cope without them. As Dr. Juran, the celebrated authority on quality assurance, has said, 'We live today behind the protective dikes of quality control'. As long as everything is working all right we can carry on; but on the day the car packs up, the television set goes wrong, the washing machine won't work and there is a power failure, then it is better to stay at the office.

Quality Assurance

The basic objectives of quality assurance are not new. What is new is the emphasis now being placed on treating quality as a straight management discipline, quite distinct from and supplementing conventional departmental responsibilities for the differing aspects of the development and production processes. With the increasing technological content and the engineering systems approach now required, one cannot hope to achieve quality in a fragmented manner relying on the unco-ordinated efforts of the individual departments, i.e., design, development, purchasing, production and inspection, each of which is directly involved in only one part of the total manufacturing processes. Hence the customer for sophisticated products, whether in industry or government, is demanding that quality must be treated by the supplier as a separate management function; that is, a separate quality department should be set up and made specifically responsible for the achievement and demonstration of quality throughout all stages of the execution of the contract, involving operational requirements and feasibility studies, design and development, purchasing, production and after-sales service. There is, of course, no magic formula; just good organization, good management, good design, efficient production and attention to detail.

What is the cost of setting up the network of technical and administrative procedures necessary to ensure quality? There is, of course, no simple answer to this. Each product has its own unique quality problems. However, if the cost of the additional organization to get the product 'right first time' is greater than the saving in scrap, rejects and warranty costs, then the quality system needs rethinking. Businesses survive by their ability to satisfy their customers and their shareholders. The former want value and the latter profits. Some people consider this causes a head-on collision, but in fact customers want the good firms to remain in business so that they can continue to purchase their products and therefore it is in their interest that such firms make reasonable profits. On the other hand shareholders do not want a large dividend one year and nothing the next, so it is in their interest to see that the company they support with their money gives the highest value commensurate with the product. Therefore, fitness for purpose is a partnership between the supplier and the customer, and the aim of any quality and reliability assurance programme should be to make it possible to acquire products from industry in such a way that both the manufacturer's costs and the customer's costs are minimized.

The Raby Committee, which was set up three years ago to study the Defence Inspectorates, stated that quality assurance meant those systems and procedures

adopted by the customer or his representative, or by the supplier, to ensure that the product meets the customer's requirements. They stated that it was necessary to differentiate between procurement quality assurance and the quality assurance activity of the supplier, and also that quality must begin with the initial specifications and be predominant through all stages of design, procurement, manufacture, in-works inspection, final testing and acceptance.

The Mensforth Committee on the Authentication of Quality stated that the quality of a product is dependent upon each part of the process by which it is conceived, produced and brought to the customer. No amount of care and attention during manufacture can overcome deficiencies in design, while materials or bought-out components which are faulty can sabotage all the skill and ingenuity of the most clever designer. They went on to say that even where a product itself is entirely satisfactory it can suffer from poor packaging, late delivery, faulty installation, inadequate operating instructions and inefficient after-sales service, and so the full benefit of quality control cannot be obtained unless the control and philosophy is applied throughout the system.

The Quality Manager's Task

The organization of any firm comprises a number of systems, each with a great deal of independence and autonomy but also needing a great deal of interdependence to get economical results. The quality manager's task is to see that all the units comprising the quality system work in harmony to produce definable end-products in the time scale allowed and within the stated cost. Obviously any successful system is dependent on its weakest link and therefore the role of each unit must be clearly identified and specified. Also, with any system there are always a number of sub-systems, all of which can easily run away on their own pursuing the myth of perfection. As a result, overall control is lost, costs escalate and the programme becomes frustrated by delays. Fitness for purpose involves a cradle to grave philosophy in which every management decision made has some effect on the performance, reliability and maintainability of the equipment.

A good quality product is one that meets the requirements of the customers adequately, is available at the right time and will be economical and reliable throughout its whole life. Quality in this sense cannot be ensured by inspection alone, which is a static as opposed to a dynamic function merely selecting good from bad. The whole process from concept to acceptance must be treated as an integrated whole. Stages must be properly planned, phased, documented and checked, and lead smoothly from one stage to the next under proper control. From the customer viewpoint there are four main essentials to the achievement of a satisfactory product:

- (a) Adequate concept formulation.
- (b) Good clear design specification and control.
- (c) Adequate production control and inspection.
- (d) A proper schedule of trials leading to acceptance.

At the concept stage there is the process of trade-off between such important characteristics as performance, reliability, safety, appearance, size, weight, time-scale, and cost. These trade-offs determine the quality levels which the designer will be asked to meet to guarantee customer satisfaction. For this to be meaningful in complex equipment, data banks and mathematical models are required. The customer always requires reliability and this can be achieved in two ways: either by 'designing in' a high level of reliability, or by reasonable reliability coupled with good servicing facilities. At this stage marketing may claim that they can only sell the product at a certain standard of quality, price and delivery, and that they must get the product to the market in a time-scale

which allows inadequate development time. Production may claim that they are allowed inadequate money for tooling, and designers will want to set a higher quality standard than necessary and use components that are unproducible. If any of these interests has a disproportionate say in the making of decisions to the detriment of the others, there is a good chance that the product will fail through inadequate quality, long delivery or excessive costs. Therefore the responsibility for such judgements comes squarely on the shoulders of the chief executive of the organization, whether or not he has a quality manager. The aim is the minimum quality which the user needs throughout the life of the project; any additional quality is wasteful.

At the design stage, it is essential that the designer appreciates fully that his task is to create a specification which will make possible the manufacture of a product which meets the specified requirements as economically as possible. Some designers tend to be more interested in achieving high performance than in achieving high reliability. Creativity is no excuse for lack of producibility; it is essential to involve the manufacturing department and sub-contractors as early as possible in the product concept and design stages. It cannot be stressed too strongly that the designer sets the basic quality levels of the product. From then on manufacturing and after-sales service can only downgrade these levels. Reliability has to be achieved in design, proved by test and retained in manufacture. One way of ensuring reliability in today's equipment is to use yesterday's components.

Achievement of Quality

Most people will agree that the Apollo moon landing has been the quality and reliability success story of this century. The basic policy of the Americans for ensuring quality and reliability are stated quite simply:

- (a) Utilize every practical means to achieve levels of reliability and quality commensurate with mission objectives.
- (b) Assign responsibility for establishing and achieving reliability and quality assurance requirements for products and services which are developed and fabricated within NASA installations or acquired from contractors.
- (c) Review and evaluate plans, systems and activities related to establishing and meeting reliability and quality requirements to ensure that desired objectives are effectively achieved.

A contractor with an inspection system may continue making scrap and rejects until the managing director concludes that it is needlessly expensive to do good work on bad material or bad work on good material; to avoid this he demands the institution of control of the manufacturing process and bought out materials. Thus quality control is introduced into the company. However, his competitors still get rich at his expense until he appreciates that they manage the whole quality function. Marketing finds out what quality levels the customer really wants and the designers design to this. Advertising gets over the message that life costs are more important than prime costs and the servicing units provide the all important feedback. Quality Bulletins appear, and education and training for all levels is instituted. This is supplier quality assurance. Quality Management has replaced Crisis Management.

Appreciating that quality problems are both managerial and technological, then customer quality assurance can only be guaranteed by dealing with contractors whose network of technical and administrative procedures and whose systematic management provide adequate confidence that the product will meet all specified requirements, be delivered by the date promised and within the cost. If a large amount of money is to be spent, it is not unreasonable to expect the contractor to put down on paper the system for ensuring quality

throughout his organization. This is the Quality Manual. Furthermore, the supplier must be prepared to offer proof that the quality and reliability standards have been met.

Dr. Juran describes fitness for use as follows:

- (a) *Quality of Design*—the specified materials, configuration, tolerances, etc., which define the intended characteristics.
- (b) *Quality of Conformance*—the extent to which execution meets intent. This is determined by process, facilities, supervision, workmanship etc.
- (c) *Availability*—the extent to which the product provides service when called upon. This depends on:
 - (i) Reliability (freedom from failures)
 - (ii) Maintainability (ease of remedy)
 - (iii) Logistic support (supply of spare parts)
 - (iv) Operating environment
- (d) *Customer Service*—the extent to which the humans (manufacturer, merchant, service shop) provide competent, prompt and honest redress in case of service failures.

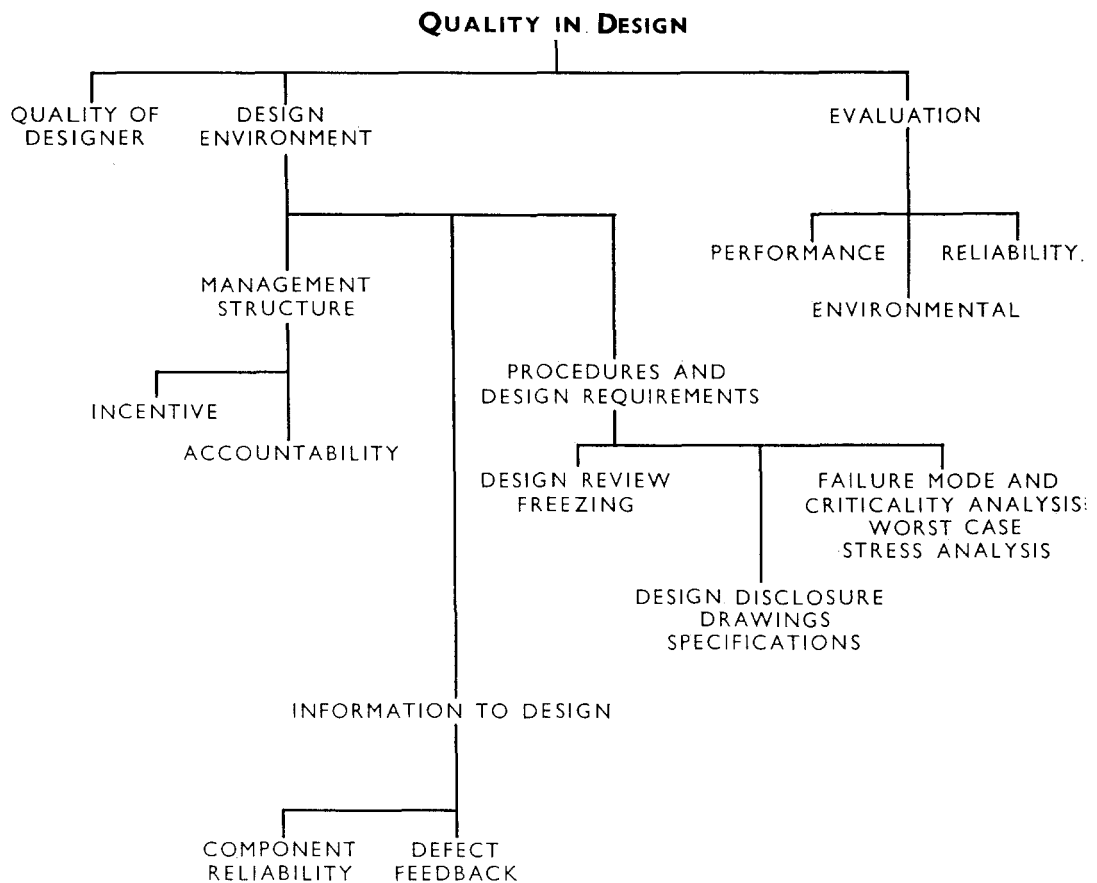


FIG. 1—ELEMENTS OF PRODUCT ASSURANCE (DESIGN)

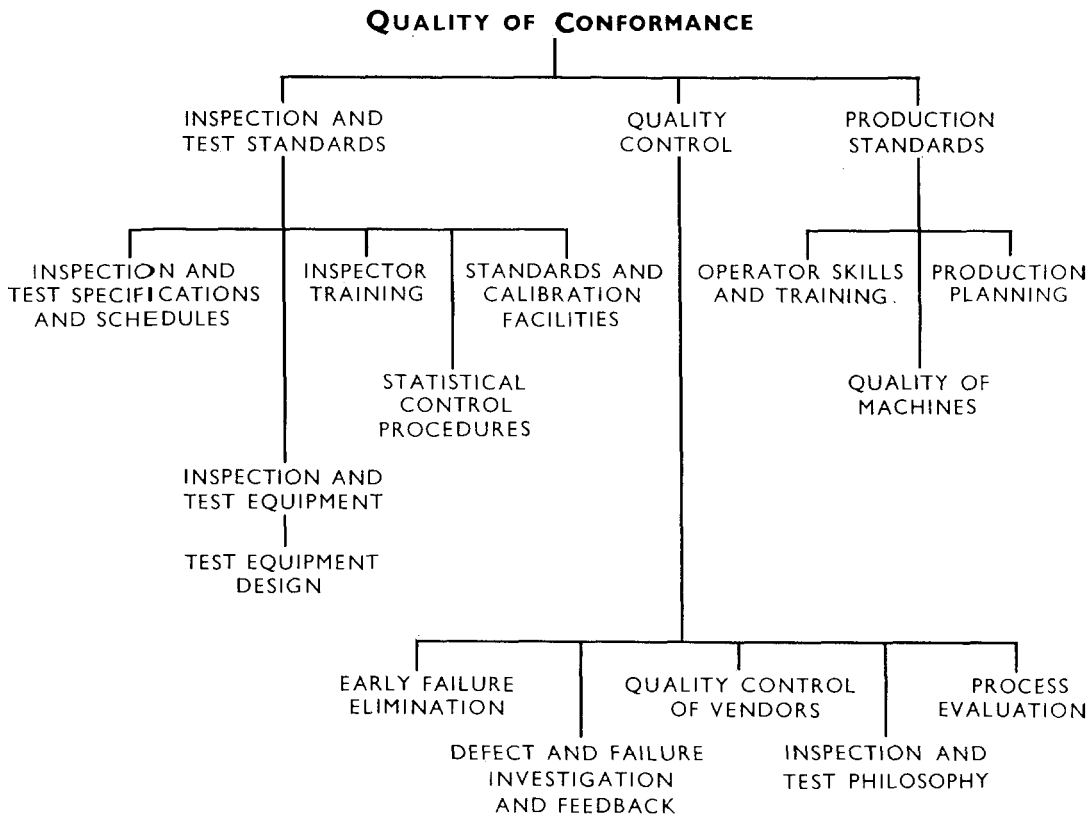


FIG. 2—ELEMENTS OF PRODUCT ASSURANCE (MANUFACTURE)

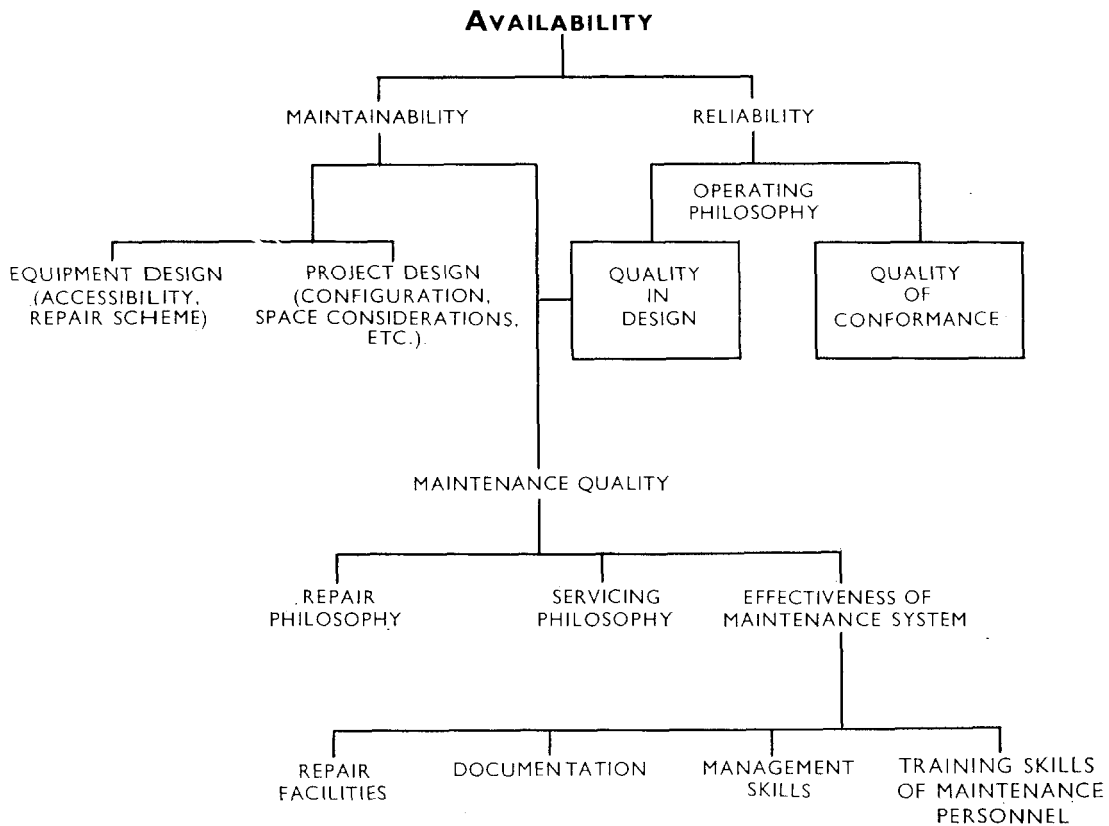


FIG. 3—ELEMENTS OF PRODUCT ASSURANCE (AVAILABILITY IN SERVICE)

Mr. Frank Nixon defines the supplier's task as follows:

- (a) Evolve product designs and specifications adequate for the customer's needs.
- (b) Confirm the validity of the designs by carefully planned and engineered development testing.
- (c) Procure materials, products and services to satisfy the specified requirements of the design, and to enable the promised delivery programme to be met.
- (d) Plan methods of manufacture and control to produce goods of the requisite quality.
- (e) Manufacture components and products in accordance with the specifications and to meet the delivery programme required by the customer.
- (f) Provide product support, by training and instruction in the proper use of the product; by skilled and prompt service; by good availability of spare parts.
- (g) Improve the product, by the speedy elimination of troubles arising in service; by collecting data on field experience, analysing it and acting upon it.

Elements of Product Assurance

FIGS. 1, 2 and 3 define the elements of product assurance in design, manufacture, and availability in service, all of which require management.

One of the most important recommendations of the Raby Report was as follows:

'That the overall responsibility for design, development, production and quality assurance of an individual item of equipment should be brought together at the lowest effective managerial level.'

The new Procurement Executive of the Ministry of Defence is organized on the principle of Project Management. If there is one organizational principle which will give an immediate improvement in quality management it is personal accountability for projects and products and this philosophy is commended to all.

There is a text in the NASA conference room at Huntsville, Alabama, which reads:

'The bitterness of poor quality lasts long after the sweetness of meeting the schedule'.

How very true!
