

# Quality Assurance: Is ISO 9000 The Right Answer?

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## Introduction

At present, quality assurance is a topical subject, particularly in Italy. The revised 46/68 Act, concerning the fineness of jewellery items, has been recently passed. In the revised Act, the lawmaker considered also the option for the goldsmith to certify his own quality control system on a voluntary basis. Up to now, it is not clear whether a certified quality control system will give a factory an advantage in the external commercial world but, certainly, remarkable advantages can be achieved inside the factory. A simple rumour that, in the revised Act, this possibility will be given to the goldsmith has been sufficient to start a rush to the certification.

Since the beginning of 1999, many Italian factories in the Arezzo and Vicenza areas achieved registration mainly to the ISO 9002 Standard, but also to the ISO 9003 Standard, concerning product certification, and ISO 9001 Standard that represents the most complete certification, covering all production steps from design to distribution. This registration has been achieved, for example, by the Crova Company of Valenza.

This implies that such companies were preparing their quality control system for registration for some time beforehand and, as far as we know, many more companies are nearly ready to apply for registration. But what really is a quality control system? Before discussing this subject, it is necessary to define the concept of quality for a jewellery item.

The definition of **Quality** is relatively straightforward for the large majority of industry products, because the various products are required to conform to readily measurable characteristics. But jewellery is a separate world. When

we ask a goldsmith about the quality of a jewellery item, quite often he or she will answer: 14ct, 18ct, 22ct, etc. The only parameter that can be accurately measured, whose measurement is required by the law, becomes a synonym of quality. However, fineness is only the "legal" aspect of quality, and it should be restrictive to identify it with the true "quality level" of a jewellery item.

There is also another imprecise definition of quality: quality is the design, the aesthetic appearance or finishing. These characteristics are subjective and cannot be measured quantitatively. These opinions come out from the fact that jewellery is something superfluous, is a fascinating adornment, so up to now no specific physical characteristics were required with the exception of fineness. The question about the definition of quality for jewellery has been already posed by Dr C. Corti in his keynote lecture to the 1998 Santa Fe Symposium: "Quality in jewellery manufacture: Beyond 2000" (1). The considerations of Dr Corti of the market for jewellery suggest that fineness is no longer the only characteristic required for a jewellery item. Major stores, like J.C. Penney (U.S.A.), QVC - the largest U.S. retailer of 14ct jewellery through TV, Marks & Spencer (U.K.) and some more companies have already issued purchase manuals with specifications for the jewellery items. These manuals are true quality programmes that producers and products should comply with. Obviously, these manuals also define the acceptance procedures to follow to be accepted by these companies as suppliers.

For some years, the minimum mechanical characteristics required for a jewellery item have been discussed in the Santa Fe Symposia. Quite a lot of work on this subject has

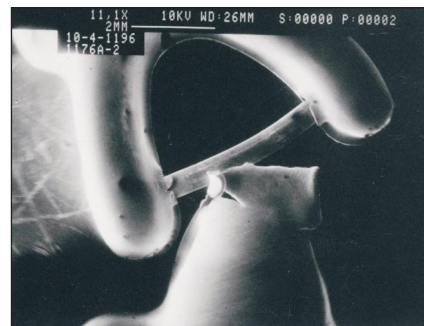


Figure 1 - Stampato chain - break of a weak link 11.1 X

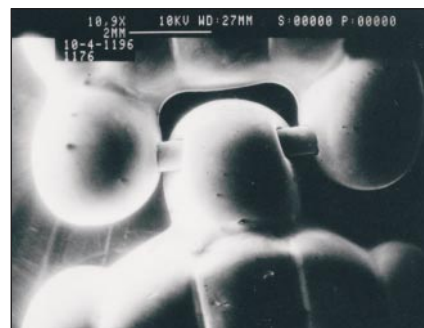


Figure 2a - Stampato chain:  
a) Joint between unstressed links

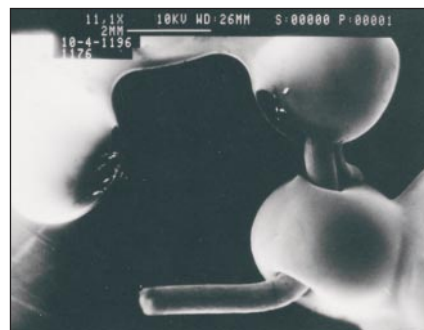
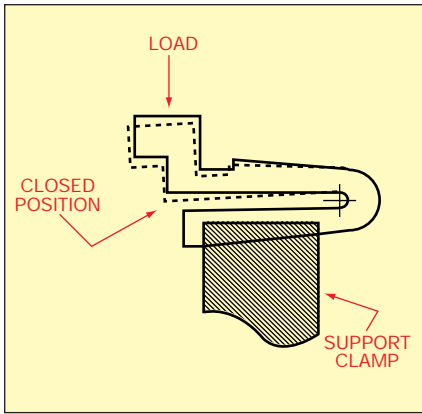


Figure 2b - Stampato chain:  
b) typical break under tensile load

been carried out in the R & D department of the Leach & Garner Co., particularly on the characteristics of chain and chain fittings (2,3). This work has not been limited to the mechanical properties of the alloys used for chain production, but includes also the mechanical



**Figure 3** – Fatigue resistance test on a bangle snap clasp

properties of finished jewellery items. For example, the tensile strength of some chain types has been measured and the minimum acceptable tensile strength has been determined, Figure 1. It has been found that a breaking load of 3.2-3.6 kg can be considered as a borderline between “strong” and “weak” chains. The breaking load of stampato chain and bracelets has also been studied, Figure 2. Attention has been focused on fatigue life of fittings, like bangle snaps, which have been subjected to open-close cycles up to failure, Figure 3.

For a long time, hardness is used as a discriminative parameter in some fields of jewellery, like watchcases and wrist-watch bracelet production. High hardness may also be considered as an indication of better wear resistance. It happens that bracelets and chains, sometimes produced by well known companies, have failed after relatively short usage, only because they had not been properly heat treated to obtain the highest hardness level attainable with the alloy used. So we see that there is considerable activity aiming to determine a set of objectively measurable physical properties required from a jewellery item to be considered “good quality”.

The subjective emotions stirred up by design and aesthetic appearance will remain a dominant factor in the decision to purchase a jewellery item. But very likely the same jewellery item will be required to conform to some specific physical property before it is offered to the customer. If we consider that the international market is very competitive and there

are laws for the protection of the consumers, who become ever more conscious of their rights, we can think that this evolution will probably take place in a relatively short time. A widespread opinion says that the jeweller's art will change into a science, or at least, it will become an art ever more controlled by science. As for every product of industry, there will be two ways to face this change when it will take place: to guarantee the quality level through control of the end product or to use prevention systems. The first way is more burdensome and is suitable only for companies with a low production level. For medium to high production level companies, the only adequate option is to work with “Total Quality”: that means to have a certified quality system (prevention system). But we should always remember that system certification has a cost. To have a return on this investment, it is necessary to take the decision to implement it with firm conviction. We should not simply follow a trend or do what our main competitor did before us. In this case the system certification will only represent a cost, that is a loss.

When we speak of total quality, we should always remember that we explore a field that could be defined as “work philosophy”. A quality system offers true internal advantages to the company only when it is adopted with conviction. These advantages come out from making the workforce more responsible, from the standardisation of production process, from a better control of company management and from an increased attention to culture level in the organisation. Additional important practical-economic advantages come out directly from the above said conditions. The jewellery producing companies can gain also external advantages: these advantages are discussed in the second part of this paper on the Caprice experience.

Before concluding this section, we would like to add a couple of considerations. First, to have a certified quality system does not automatically mean that a good quality product is produced. The quality system gives the mental approach and offers the means to

keep quality under control, e.g. the management of non-conformities. However, if an error sneaks in, maybe because a written and approved production procedure is incorrect, this error will be repeated endlessly, until the production procedure is corrected.

Secondly, in addition to the undoubted benefits for the single company, the best results will only be obtained when the whole world of goldsmiths will operate in a general quality system, where all operators, like suppliers, goldsmiths, wholesalers, etc., are certified. Certifications scattered here and there in the field of jewellery production and trading will be scarcely effective, with the exception of the internal effects. Even now, there are certified suppliers and, sometimes, we see fake analysis certificates, certifying untrue properties, and so on: we are here in the field of the certification done to follow the fashion: it creates a very good impression in the headed paper, but nothing more.

In the last two years, well known foreign companies that have their jewellery items made in Italy, passed from an accurate visual inspection of product quality to the examination under a stereoscopic microscope at 20x magnification. We do not know whether this examination is adequate and what limits there are for rejection. What we want to say is that the goldsmith will produce for a market that becomes more demanding day after day: but are we sure that his suppliers will be so much ready and flexible?

Metallurgy can give many answers to the new requirements in the field of jewellery production, but how many suppliers are up to date and are ready to care about possible goldsmiths' failures that, maybe, could be due to alloy inadequacy? This is the meaning of working under quality certification. In our opinion, goldsmith's metallurgy should be kept as simple as possible. It is a nonsense to hear of “improved” alloys containing as many as 12 or 14 elements! We dare anybody to keep

under control so many elements with the equipment usually available to a goldsmith!

Therefore, in our opinion, it is desirable to go towards a deeper involvement in a modern concept of quality, by means of system certification, as already happens. However, this involvement should concern the whole world of jewellery production and it should not be expected only from the goldsmith.

### **ISO 9000 And The Business World**

The business world today is fast changing. Products and services are merging. Separation between structure and process, owning and using, knowing and learning, real and virtual is not clear. Less and less distinguishes the employee from the employer. In the new business world, in which we live and work, the organisation operates and changes in real time, everything is electronically connected and every offer to the customer has both tangible and intangible economic value. Therefore, there is a need for tools that can serve as a framework for good management practice and are accepted in the global market. ISO 9000 is a management tool that is currently under major revision and will, no doubt, have an impact on both general policy issues and specific requirements in the business community.

ISO 9000 standards are a set of internationally recognised quality management standards and guidelines. Since their initial publication in 1987, they have earned a global reputation as the basis for establishing quality management systems (QMS). Their primary aim is to provide organisational guidelines on what constitutes an effective quality management system, which, in turn, serve as a framework for continuous improvement.

The ISO 9000 family have come to represent a consensus on good management practice and are accepted as national standards by more than 100 countries all over the world. This has resulted in the certification of over 200,000 organizations world wide (5,500 in Israel) with many more in the process of setting up and implementing this

powerful management tool.

This part of the paper describes Caprice's adoption of ISO 9002 requirements as a management approach for process and production control and, in turn, productivity and quality improvements, both in products and services.

### **Introduction to ISO 9000:2000**

Over the past few years, the International Standards Organisation (ISO) has received feedback from users of ISO 9000 standards. A design brief was developed and researched. More than 80% of the 1,100 organisations which participated in the questionnaire wanted the new standard to:

- Employ a process approach
- Be compatible with other management systems
- Include continuous improvement
- Fit stakeholder's needs
- Be user/customer friendly

The new ISO 9000:2000 standards have been based on eight quality management principles which reflect best management practices, facilitate an evolution towards business excellence and emphasise the need to satisfy all interested parties in the business world. These eight principles are:

- Customer-focused organisation
- Management leadership
- Involvement of personnel
- Process approach (production and services)
- System approach to management
- Continual improvement
- Factual approach to decision making
- Mutually beneficial supplier relationship

In the new revision of the International Standard, there will be a single Quality Management Requirements standard (ISO 9001) applicable to all organizations, products and services, which replace all the current three QA standards (ISO 9001,9002,9003). It is intended that all requirements of this Standard be applied. However, when customer requirements or the nature of product and/or service preclude the applicability of certain requirements for processes specified in that Standard, such requirements may be excluded. For example, where the organisation's product is

stated in terms of an established design or specification, the Design and Development requirements of the new standard do not apply (similar to the current ISO 9002 level).

Time table: the Draft International Standard (DIS) for vote by Member Countries is due in the 4th quarter of 1999, publication of Final Draft is due in the 3rd quarter of 2000 and publication of International Standard is due in the 4th quarter of 2000.

### **Why a Quality Management System?**

#### *Caprice Profile*

Caprice is a jewellery production and sales company that manufactures gold and platinum jewellery, set with precious stones and diamonds. To understand the whole approach to the quality management system at Caprice, a short summary of the company profile is useful:

- 610 employees are working at Caprice, 110 at the manufacturing plant and 500 in the marketing, sales and administrative area.
- Current production capacity is 160 Kg of fine gold and platinum (14ct-9%, 18ct-90%, Pt-1%) which are processed on 4 production sites.
- There are 5 showrooms, 7 owned shops and a subsidiary company for the export market.
- Total turnover in 1998 was 50 million dollars.

### Case History

During the year 1994, the Caprice organisation doubled its sales and this affected the size of production, the business area, employees and showrooms. Out of the rapid growth, the need for a reliable management tool was recognised. In turn, this led to the creation of the Quality System approach in which over 100 major processes in all the organisational activities were evaluated, understood and documented and 10 Quality Improvement Teams were established to analyse, document and work, using problem solving techniques to improve quality and the productivity of crucial operations.

The unique Caprice “solution book” for its Quality System included reorganisation and restructuring of the existing process and quality related activities and the establishment of new activities in the production area to evaluate quality, costs and effectiveness.

### Continuous Improvement

Based on the success of the initial phase in 1994, the Caprice management decided to place emphasis on continuous effort for understanding all the processes and establishing teams for improving each individual process. The outcome of this effort was a structured and systematic mode of operation and the use of quantitative measures for operations and management decisions.

Four major strategic elements and goals were targeted in the organisation:

- Quality: Less faults and production errors in operations.
- Market: Increase market share and customer satisfaction (return customer and not return merchandise).
- Time: Reduce process time and overall production and order process cycle time.
- Cost: Lower the production cost per unit of product and/or service.

### Why ISO 9000?

#### Strategic Concepts

Several strategic concepts stood behind the management decision to use ISO 9000 standard requirements

as a driving force for Caprice' Quality Management System. The three main concepts were:

- Leadership in establishing quality management system.
- Use of a third party organisation for recognition of the quality system within the industry.
- Utilise a systematic approach: ISO 9002 requirements for Production and Service quality management system

#### Internal and External reasons

There were also internal reasons for the use of ISO 9000. The main ones were to standardise the processes through the means of:

- Structured procedures and work instructions.
- Internal audit system for ensuring the compliance.
- Systematic system for evaluating non-conformities.
- Initiation of corrective and preventive actions.

The external reasons for the use of ISO 9000 were related to Market issues and Global Management views such as:

- To obtain national recognition through the Standards Institute of Israel (SII) as an Approved Quality Organization.
- To receive and use the international certificate of the International Quality Network (IQNet) to obtain world-wide recognition.
- To utilise an independent third party (i.e. SII's auditors) for periodic surveillance audits to highlight problem areas and as a means for continuous improvement.

### Caprice implementation of ISO 9002

#### Major Milestones

The following milestones can be highlighted on Caprice's road to implementing the Quality Management System according to ISO 9002 requirements and thus obtaining SII Certification:

- **August 1994:** Management Steering Committee established and set the initial Quality Policy of Caprice. The management also nominated the broader Quality Management Team as an execution force to implement the policy in the Caprice

organisation, to learn the standard requirements and their implication on production and sales activities.

- **February 1995:** External consultant was involved to guide and assist the internal Quality Management Team. The project activities were established, with the blessing of the management, and departmental training, with full employee co-operation, was initiated to implement quality requirements.
- **June 1995:** Over 100 work instructions were written and approved as an outcome of the previous work done by the process improvement teams.
- **August 1995:** The management procedures were added to the work instruction and the internal audit process started as part of the assimilation process in the whole organisation.
- **September 1995:** Quality procedures were sent for external review and approved by the Certification Body (SII). Thereafter, external audits by SII auditors were performed in all Caprice facilities.
- **November 1995 – January 1996:** Based upon the findings of SII audits, corrective actions were taken by Caprice personnel and reported to the lead auditor of the certification body (SII).



Figure 4 – ISO 9002 Certificate

- **February 1996:** Caprice file was submitted to the Certification Committee and the certification obtained, Figures 4 & 5.
- **March 1996-ongoing :** The Quality Management team established continuous improvement process which includes internal and external audits and continuous training program.

*Quality Investments (Yearly)*

The road did not end when certification was obtained. To the contrary, this was the beginning of a new culture in the organisation. One can ask what is the yearly average invested effort in the Quality Management System? It is calculated in Caprice using working hours as follows:

- 2000 hours invested by the Management.
- 4000 hours invested by the Quality Team.
- 10000 hours invested in general quality training.
- 50000 hours invested in On-Job training (OJT).

Figure 6 – Vendor performance evaluation

**Practical Benefits of ISO 9002**

*Quality Factors*

The immediate investment in quality should result in long term benefits to the organisation. Typical examples of the benefits obtained by Caprice from its quality investments are:

- **Purchasing:** 80 vendors have yearly evaluation of their quality performance in order to be nominated as Caprice’s qualified vendors, Figure 6. The result is a 7 – 10% decrease in purchasing cost.
- **Traceability:** Rework of product and/or service is traced back to the worker who did the original job, through the personal stamp system. Therefore, work is always performed by the same person and any rework is returned to him. Feedback and an incentive bonus scheme was established in due course. The result is 20% increase in production volume and personal bonus as a result of eliminating rework.

*Main Process Quality Upgrade by Technology*

The main process that was focused in the production line was the whole investment casting process. Dr. Faccenda assisted in upgrading the process capabilities that resulted in the following quality and technology outcomes:

- Updating all related quality and production procedures.

- A 30% reduction in defects of cast products.
- A 30% reduction in gold losses in production and rework.
- An 8% immediate growth in production capacity.

As a result Caprice succeeds in penetrating new markets via higher quality products.

*CAPRICE'S Central Customers Service*

One of the ISO Quality Management System requirements is to get the customer’s feedback as a mean of process improvement and upgrading customer satisfaction. Therefore, the Central Customer Service of Caprice was put in the focus of the quality team for establishing the proper procedures and implementing quality improvement tasks to upgrade its performance. This effort has had the following results:

- A 3% reduction in the total service cycle time.
- 97% level of satisfied customers in the February 1999 survey.

The customer survey, Figure 7, showed that highly trained service and sales personnel, improved product quality and the configuration of the exhibition at the showrooms, Figure 8, were the main reasons for their growing satisfaction.

Figure 5 – Typical procedures form

Figure 7 – Customer feedback



Figure 8 – Typical Caprice showroom



Figure 9 – Israeli Hallmarks

## Caprice's cost of quality

### Quality Cost Elements

The cost of Quality, which actually means the cost of non-quality (i.e. not performing tasks to 100 percent quality), is usually divided into 4 major elements:

- Prevention cost, which includes activities to prevent costs due to poor quality occurring and activities such as quality management, quality design activities, general and specific training, internal audits, etc.
- Appraisal cost, which includes the entire incoming, process and final product quality inspection and quality assurance activities, either done internally or externally as required by the regulation.
- Internal failure cost, which includes rework activities, defective products, corrective actions and scrap products.
- External failure cost, which is due to after sales activities such as: products returned for rework, sales cancellation, customer complaints, etc.

### CAPRICE'S Approach to Cost of Quality

Caprice's approach to the quality cost issues is based on Deming's 4 elements cycle to control processes namely: **Plan, Do, Check and Act** (PDCA) as follows:

- Plan quality cost targets for each process or activity performed in production or the sales area.
- Do the monthly cost calculation of all non-quality items.
- Check all non-conformity reports that contribute to the cost of quality.
- Act with your personnel to perform the required corrective and preventive actions to reduce the cost of quality.



Figure 10 – (a) & (b) Caprice jewellery

### CAPRICE's Yearly Cost of Quality

The cost of Quality can be presented in many ways. Caprice decided to present its cost as a percentage of the total production cost and calculated this as 9.6 % of the production cost. It is divided into 4 elements as follows: 5 % Prevention cost, 2 % Appraisal (internal) cost, 1.2 % Internal failure cost and 1.4 % External failure cost.

### Conclusions

Caprice decided to establish a Quality Management System based on the ISO 9002 standard requirements and to implement it in the organisation as a management tool. The aim was to

improve productivity, product quality and customer satisfaction and to reduce costs arising from poor quality. This decision has resulted in the following advantages:

- Increased sales by utilising the quality management system approach.
- Customer awareness and appreciation of Caprice's quality of products and services.
- Standardisation of work processes and services via the process approach methods.
- Employee's satisfaction, resulting in less absence and staff replacement.
- Improved competitiveness and capability to penetrate new markets.
- Reduced overall cost of quality expressed as a percentage of production cost.
- ISO 9002 Quality Management System Certification and worldwide recognition.

Thus, Caprice enters the new millenium with a mature Quality Management System that will be upgraded to the new ISO 9000:2000 requirements.

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