

Japanese Quality Science and Culture

Andrei Octavian PARASCHIVESCU
George Bacovia University in Bacau, ROMANIA
adiparaschivescu@yahoo.com

Abstract: *The objective of this work was the research of the directions for acting of the characteristics of the Japanese concept of quality, of the methods used in Japanese management continuous improvement. By analyzing the contribution of the largest Japanese researchers and trainers in quality (K. Ishikawa, G. Taguchi, S. Shingo, M. Imai, N. Kano) demonstrated that Japanese school is a model of good practice and quality culture quality management.*

Keywords: *quality, quality management, Ishikawa, Taguchi, Shingo, Imai, Kano.*

Introduction

Japan's contribution to international quality movement was and it is still essential. After the Second World War, Japan chose the path of national recovery through trade, returning to civilian goods production rather than military. Aware that the expansion in international markets was possible only through quality, Japanese people tried and succeeded to learn how other countries have mastered quality to achieve competitive products. They started following three directions:

- famous companies sent teams abroad to study their approach to quality;
- translated into Japanese foreign literature specialists;
- inviting speakers from other countries to come to Japan and deliver training for managers.

Faced with the challenges of contemporary society that compel organizations to find new management strategy, Japan experienced principles inspired by their culture, finding in the *communities Knowledge model* an effective alternative to traditional methods. Japanese approach of the knowledge management is based on community and the existence of a „collective mind”.

Through these actions, but also by engaging in the Japanese Association of Scientists (JUSE), thousands of researchers and practitioners have been developed and implemented strategies for revolutionizing quality as they never did before. All these actions were based on education and training for quality.

Competition between companies which occurred in recent decades has led to the necessity of selecting those who have achieved very good results, exceptional ones, based on a model of „excellence”. The first model of excellence was also created in Japan.

1. The Japanese Revolution on Quality. Quality Culture

In the years 50 Japanese made not a secret from admitting their lack of competitiveness and chose the strategic path forward through research, teaching and application of best practices in quality management from other countries. Paradoxically, these countries did not applied into practice their own discoveries until much later, and even studied Japanese practices. The example of total quality illustrates this phenomenon. In 1956, the American Feigenbaum publishes a book about total quality in which the basic principles and approaches that Western companies are striving to introduce at the beginning of the 80s. In the years 60 Japanese companies had already taken and applied the concepts of Feigenbaum.

The characteristics of the Japanese concept.

After Ishikawa the management concept in Japan is characterised by the participation of all categories of staff and all services. What is the opposite of the idea of quality for the specialists in American organizations?

Japanese flow quality is characterized by [6, 71]:

- Practicing quality by all,
- Training for all and consolidation through internal training
- Quality Circle,
- Diagnosis apply to every case (as well the rewards).

Among those who contributed to the Japanese quality revolution have been Deming and JM Juran, the American specialist in quality, of Romanian origin. His name is associated with Deming Prize and Medal for quality in Japan.

Juran was invited at the beginning of the years 50 by JUSE to observe the approach of quality research and do a critical research and deliver training courses in quality management, and special seminars for CEOs - "senior managers", as Juran calls them [10, VIII]. According to Juran, strategies were critical to the quality revolution [10, 5]:

- Senior managers have taken personal charge of leading the revolution,
- Train all employees at all levels in quality,
- Improve the quality to make the pace, revolutionary,
- Employees were actively involved in quality improvement through quality circles.

Juran considered Japan as world leader in quality management, because in this country has been a revolution, not an evolution in this field [16, 87].

During the years 60's and 70's Japanese firms showed increases of the market share even in USA. One of the main reasons were the superior quality. Juran believed that, in general, American companies did not understand the trends and remained convinced that Japanese competition was actually first a competition in price and not in quality.

In 1967 Juran warned that Japan is moving towards world leadership in quality and will achieve it in the next two decades "for no other country is advancing with such a pace" [10, 6]. Since then more and more researchers and managers also are interested in "quality Japanese miracle". Quality strategy developed with the help of foreign experts meant the revolution in quality. Juran said that in Japan there was a "quality revolution" due to the involvement of managers and all staff and that success was due to "a national effort" [2, 182]. The effect of "revolution" was the expected one. The most notable result of Japanese quality revolution was the tremendous growth of exports of goods. Western reactions to Japanese quality revolution were very different: the assuming of some unrelated strategies to improve competitiveness through quality. They were, rather, efforts to block imports through restrictive legislation and calls for the purchase of domestic products. In the end they reached the Japanese model.

Japanese answer to the question "How could it be possible such a miracle?" is in most cases - *the Japanese!* In order to solve quality problems Japanese tried and succeeded to learn how other countries have achieved high quality products.

“It is possible to be explained only by a simple miracle that a country defeated in the Second World War, which was in a state of economic ruin, with an industry destroyed, with great human and material losses, with the morale of people driven to despair after hundreds of aerial bombing, endured months, days and nights, that culminated with the two atomic bombs, with hunger and misery, a poor country in terms of natural resources, without fields in order to organize a plentiful agriculture, could and came within a few decades to recover from the economic point of view, to rise in this platoon leading of the heading countries of the world, to occupy and maintain first place many years in some of the most important economic fields. Is this just a simple miracle? What did other nations lack when possessing a less evil situation at the end of the war to achieve such performance? Miracle? ... The explanation for this lies in the spirit of the Japanese people, endowed with a strong sense of the future and the strong

motivation for work and education.” [22, 143]. I reported the words of Japanese from about forty years ago, in dialogue with a Romanian specialist.

The existence of a Japanese culture for quality, with companies facilitating the technological innovation and finally with the economic efficiency of enterprises, one can find an explanation for the level of the overall training of the industrial population and ongoing research in quality which is sustained and maintained through quality circles.

2. The Japanese School for Quality

Within the Japanese society, the knowledge economy is deeply rooted in culture. Pierre Fayard believes that "this concept moves the strategic centre of knowledge management from the inventory placement, of contents and formalized knowledge, towards the one of streams flowing between players and remains in motion". Within the American vision (and not only) the management of knowledge focuses on databases, to feed knowledge. The two trends are present in Ikujiro Nonaka, who insists on this traditional reality of the Japanese society, where there exists a lifelong learning and where information is accessible in the environment itself. Large organizations such as the Japanese company Fuji-Xerox are studying knowledge management practices of Japanese companies' worldwide, animating debates and introducing new ideas by those thinking groups called Dynamic Knowledge Initiative (DKI) [4, 119, 126].

It seems that in Japan the science and technology was introduced at a national level, in all strata of society in a very controlled way, that there was "approached the learning habit by using three means: *television, national education and foreign school*" [4, 20]. As recognized by Noray Jouslin Bertrand [9, 7] Japanese quality movement "was in a constant openness to new ideas."

It is not without importance that among the world's most famous quality experts, W.A. Shewhart, W.E. Deming, J. M. Juran, A.V. Feigenbaum, P. Crosby, K. Ishikawa, T. Peters G. Taguchi there are to be found two Japanese (Ishikawa and Taguchi) but also those who have contributed significantly to the development of Japanese school for quality (Deming and Juran) [19, 53-69].

Along with Ishikawa and Taguchi, Japan has given to the world other important specialists in quality management also: *Genichi Taguchi* (creator of the seven principles for quality improvement) and *Masaaki Imai* author of reference books such as: "Kaizen, the key to Japanese competitive success", "Gemba-Kaizen - Art management with a sense", Noriaki Kano, *Shigeo Shingo* and others.

Kaoru ISHIKAWA (1915 - 1989) is considered the largest specialist in quality in Japan. Although Deming and Juran receive the credit for the miraculous transformation of Japan, Ishikawa was the true genius because he took numerous concepts, combined them, developed and implemented them all effectively. He was an honorary member of ASQC, association which established the Ishikawa Meda in 1986. His researches were focused on the main instruments of quality improvement: standardization and quality control. He developed the chart in "herringbone" - Ishikawa diagram.

Ishikawa was the originator of the concept of *quality circle* (Quality Control Circles), he has designed and developed the *diagram "cause and effect"*, known today as the Ishikawa diagram. He argued that the best way to improve performance is to delegate authority and to train employees in the general area of *qualitology*.

Ishikawa has called his own concept "Company Wide Quality Control (CWQC), a concept pleading for a total commitment of staff in the achievement and continuous improvement of quality. The basic components of CWQC are:

- *Quality assurance;*
- *Controlling quality;*
- *Controlling costs, quantities and delivery dates.*

Ishikawa assigns the *internal customer* quality to people involved in the process of realization of products / services, as opposed to final beneficiaries that are the *external customers*. This principle will be one of the basic elements of *total quality management*. "*Quality is to develop, design and produce the most economical, useful goods and the most satisfactory to the buyer. To assure quality is also to assure the manufacturing price, the sale price and the benefit.* "

Ishikawa designed quality as a way to manage the entire organization. To him the transformation of management means to apply six principles:

- ***Quality first***, not short-term profit.
- ***Customer focus***, not to the manufacturer.
- The next process is your customer- ***sectorisation barrier removal***.
- Use facts and data to make presentations - using ***statistical methods***.
- Respect for human, as a philosophy of management – ***the management of total involvement***.
- ***Inter – operable management***.

An important contribution of Ishikawa is the statistical aspects of quality assurance. He believes that the seven basic statistical tools (Pareto diagram, cause-effect diagram, correlation chart, histogram, etc.) should be acquired by all staff of the company, from the top management to the last worker, thus solving about 95% of the problems that may arise in quality.

The concept of "quality circle" was developed by Ishikawa and adopted by Juse. The definition given by Ishikawa was [13, 269]: "A quality circle is a small group constituted by workers to perform volunteer activities related to manage quality in their jobs."

Ishikawa believes that better results achieved by Japanese industry, compared to the western are due to the different approach of quality at the level of the company. In western European countries, quality assurance is the concern of specialists. In Japan the concern for quality is total and permanent for all the employees.

An organization can excel only if it capitalizes the full potential of every individual within it, stimulating creativity, giving reasons of pride and making him aware of his own value. In one of his works (1984) Ishikawa acknowledged that "individuals are more productive and efficient than teams in solving quality problems."

Ishikawa's ideas were summarized in 11 points making up his philosophy in the field of quality [21, 7]:

- ***Quality begins with education and ends with education.***
- ***The first step is to know the consumer's requirements.***
- ***The ideal state of quality control is when inspection is no longer needed.***
- ***Eliminate the underlying causes, not symptoms.***
- ***Quality control is the responsibility of all workers in all sectors.***
- ***Do not confuse the means with the goals.***
- ***Put quality first.***
- ***Marketing is the input and the output of quality.***
- ***Top management must not show anger when facts are presented to the subordinates.***
- ***95% of a company's problems can be solved with the seven statistical tools.***
- ***Data without tolerance intervals are false.***

In his speech at the 17th Annual Congress of the European Organization for Quality, Belgrade, 1973 Ishikawa synthesized the stage between 1950 and 1960 as follows:

- Nothing is more important than free competition;
- Without free competition, as internal and external stimulus, the product quality can not be improved in any way;

- Positive policy is needed to improve the quality, so that products can be competitively exported to Europe and America;
- Workers must assume responsibility for products quality;
- Quality Assurance in the manufacturing area is one of the important tasks of the technician.

Ishikawa looks quality beyond the product features. The program objective is to provide a product that offers a full satisfaction to the user, including service operations and even "public image" of the company within the group of constant or occasional buyers of the product in question.

Genichi Taguchi (1924-2012) was a professor at Aoyama Gakuin University in Tokyo and senior consultant for organizations such as Toyota, Fuji Film and Nippondenso.

He was the one establishing the relationship between the loss of function "loss of quality" and the ration Sign / Noise enabling the beginning of a product development in a necessary period of time and of the reasonable improvement of costs, known as the "Taguchi's method" [14, 56]. Taguchi method proposed to improve the quality and during the design phase and reduce the costs for developing new products. "Taguchi's method was introduced in order to examine the relationship between the noticeable loss and the deviation from quality" [13, 460].

The seven principles of quality improvement proposed by Taguchi underlying quality improvement are [20, 34]:

- The loss made to the company is an important dimension of product quality;
- Continuous quality improvement and cost reduction are needed to achieve business continuity;
- Improved quality is achieved by reducing the variability of quality characteristics in relation to their optimal value;
- Loss due to the variation of performance is usually proportional to the square of the deviation of target value Taguchi;
- Product design and of the process have a decisive influence on the quality of the product and its cost;
- Change in performance may be reduced by exploiting the nonlinear effect between the operational parameters product / process and the desired characteristic of the product;
- The direction of the parameter product / process that reduces performance variation can be identified by statistically designed experiments.

Taguchi's concept generates a system of quality oriented towards design, combining quality engineering with statistical methods to improve quality and reduce costs by optimizing product design and manufacturing processes. These methods were first introduced in 1980 (for companies AT & T, Bell Labs, Ford, Xerox), having today a huge spread. Taguchi methods have been treated with great interest and have contributed to:

- *a new philosophy* of quality through attention to design and quality measurement;
- *a new subject* about quality: the complete design activities and evaluation criteria prior to the event, to determine the influence of a factor by making the whole experiment;
- *simplification and streamlining* the design and realization of products and services.

Quality is defined by Taguchi as the quality loss function (Quality Loss Function), having as objective a reduced variation around the target, with minimum costs. The way to achieve - careful design - reduces variation (dispersion of values) without eliminating the cause of variation; it enables the achievement of a consistent performance, making the product / process insensitive to the influence of uncontrollable factors.

Shigeo Shingo (1909-1990). Although less known in the Western countries, Shigeo Shingo linked his name of the three terms recognized in quality management: Poka Yoke (mistake proofing, a means that keeps from doing wrong), Single Minute Exchange of Dies (SMED) and Just In Time (JIT).

Shingo conducted engineering consultancy activities in automobiles industry in Japan (had collaboration with Toyota and Mitsubishi). During the 1970s, Shingo travelled to Europe and North America to deliver many courses or implement its concepts.

Poka-Yoke System is considered as the basic principle of improving quality, and Shingo detailed the following directions in which one can move [20, 36]:

- using it as an active part of the process in order to identify functional errors before they cause the occurrence of nonconformities;
- reporting trends that do not fit or even stop the process;
- excluding the use of verification techniques since the process can not achieve non-conforming products;
- using the human factor only as an analysis and correction of non-functionality process.

Shingo's researches for quality improvement based on achievements in the field of peak technology in the field of automobiles with immediate feedback led to the creation of a new dimension to the concept of "zero defects" (totally different from that of Crosby), emphasizing the importance of the precautionary principle.

Dr. Shigeo Shingo wrote 14 books and hundreds of important works for production. In Japan, Shingo Prize is awarded for excellence in production as recognition of the contribution of Dr. Shingo to the quality improvement.

Conclusions

According to Hermel [6, 65] the historical analysis of the movement for mastery and continuous improvement of quality shows that its germs appeared more than fifty years ago in the United States and Japan, but it took a long time to their implementation. The first who succeeded was Japan. The example of Japan which succeeded through "quality Japanese miracle" is recognized today by all the qualityologists, managers and specialists worldwide. A proof of this fact stands in the many complex comparative analysis of quality management in which the Japanese management is not missing. Most American, European, Asian schools have as a model the Japanese management of quality.

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