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Abstract: The purpose of this paper is the comparison between the Japanese, European, and American ways to apply Total Quality Management (TQM). The study is restricted to the automobile industry which shows great interest in TQM. A recent survey measured the increased quality of the cars produced. It revealed that average number of problems people have in the first 90 days of ownership has decreased by 41 since 1987. Last September, TQM importance was highlighted in France when Raymond Levy, chairman of Renault, became president of the European Foundation for Quality Management. Renault runs a major TQM training program, spearheaded by Japanese guru Masaaki Imai.

**The TQM Application in the Automobile  
Industry: Comparison Between Japan, Europe  
& the U.S.**

**Segolene Badelon  
EMP-P9456**

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IN THE AUTOMOBILE INDUSTRY  
COMPARISON BETWEEN JAPAN,  
EUROPE, AND THE US

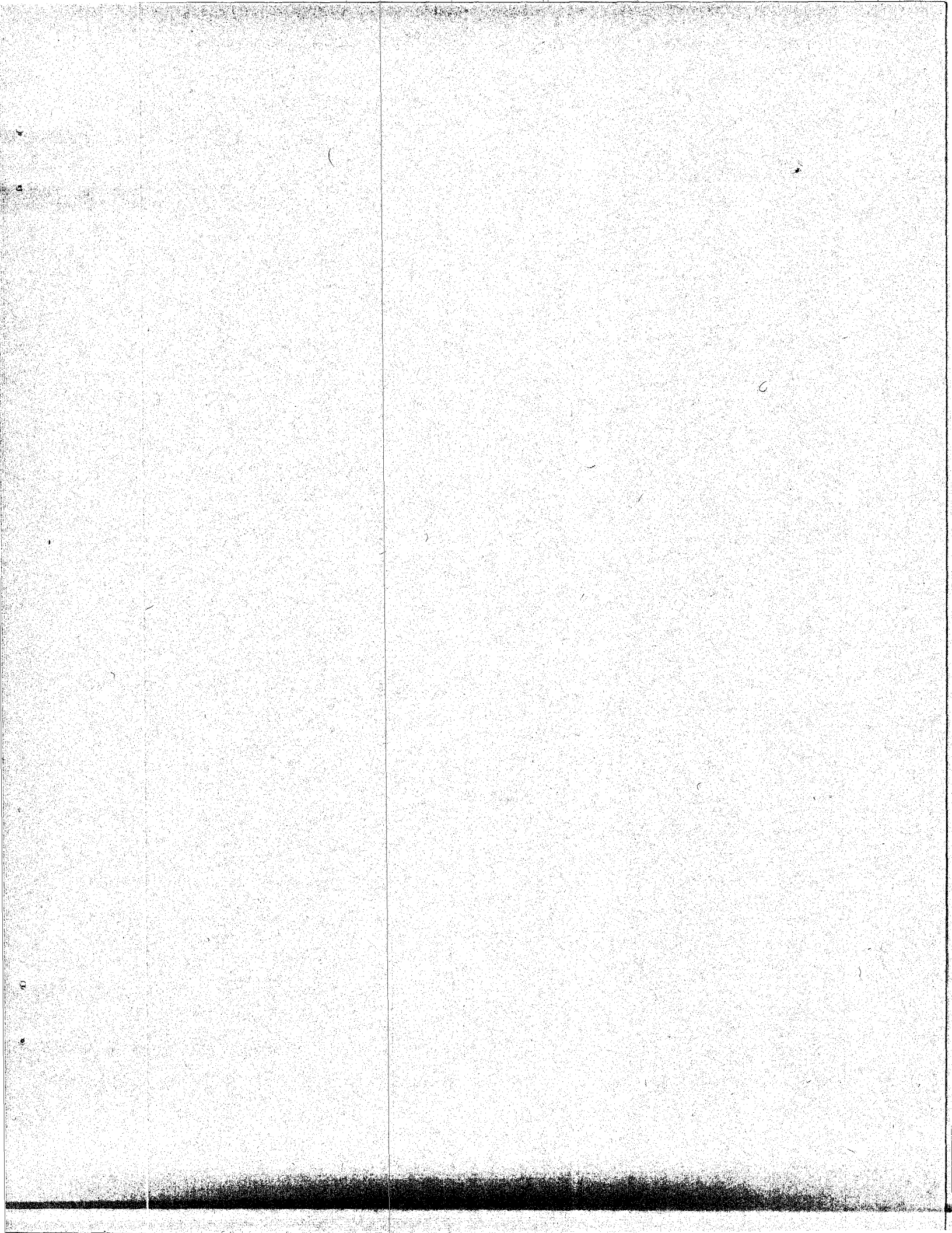
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## **INTRODUCTION**

The purpose of this paper is the comparison between the Japanese, European, and American ways to apply Total Quality Management (TQM). The study is restricted to the automobile industry which shows great interest in TQM. A recent survey measured the increased quality of the cars produced. It revealed that the average number of problems people have in the first 90 days of ownership has decreased by 41 since 1987 [7]. Last September, TQM importance was highlighted in France when Raymond Levy, chairman of Renault, became president of the European Foundation for Quality Management. Renault runs a major TQM training program, spearheaded by Japanese guru Masaaki Imai.

## **HISTORY**

In Europe and the US, the quality of products has always been of major importance. In 1664, French J.B. Colbert wrote [9]: "If our factories could, through care, impose the superior quality of our products, foreigners would see the advantage of purchasing French goods and money." To this end, US and Europe have been using statistics to control quality since before World War II.

The history of quality concern begins for the Japanese industries after World War II. The chief aim of Japan was to revitalize industry and reconstruct their economy. A high priority was placed on eradicating the image of "Cheap, but bad quality" that Japan acquired during the war. Japan, with the help of American experts, began to develop Quality Control (QC). It leads to accurate and efficient inspections and to the separation of good quality products from the rest. Soon after, attempts were made to control quality at the source. Statistical methods publicized by W. Deming, were largely used, thanks to the encouragement to the

manufacturing plants to start systematically training the workers to the QC concept.

In the second phase, efforts were placed on manufacturing "built-in quality" products (so called by Masayoshi Asawa [3] p131). Its concept is that quality originates in the process of production rather than in the inspection of sorting stages. In order to tackle production problems, QC circle meetings began to be widely used. The employees were allowed to solve problems themselves. This was the beginning of empowerment.

In the third phase, the QC activities aimed at improving the quality of companies in order to fulfill social responsibilities, by contributing to the welfare of society. To apply TQM, they began to develop a "management by policy" system which turned out to be the most efficient method of carrying out QC. J. Juran said about Japan ([6] p23) "Japan created its own quality revolution. If Dr. W. Edward and I hadn't gone there, they'd still be right where they are now, because the chief contributors to the revolution have been the Japanese managers. I learned a lot more from Japanese managers than they learned from us." By now, Japanese industries were far ahead of their American counterparts. At this point, American companies decided to apply TQM philosophy, with the Japanese model as a possible approach, not the only one.

## **IDENTIFICATION OF THE CUSTOMERS' NEEDS AND BENCHMARKING**

### **2.1. Why it is important**

Before the TQM movement, most company's philosophies were "company first", and business leaders were apt to seek only profits for the company's continuation and development. This can be called a profit oriented management. Therefore, the quality was only good enough to assure that a product functioned, without regard to its longevity, feasibility, or beauty. No attention was placed on the requirements of the customers. After the customers' requirements



had been identified, they had to be translated into specifications for design and manufacturing.

## 2.2. The Japanese attitude

The Japanese identified three types of customers' needs [24]:

1-The spoken (expressible) are those about which the customer will speak about.

Ex: six seats, four wheel drive car.

2-The unspoken (expected) are those that the customer can, but generally does not speak about.

Ex: a safe car, a quiet car.

3-The unspoken and exciting are those that the customer cannot tell about because he/she doesn't even know about. These *may* become expressible over time.

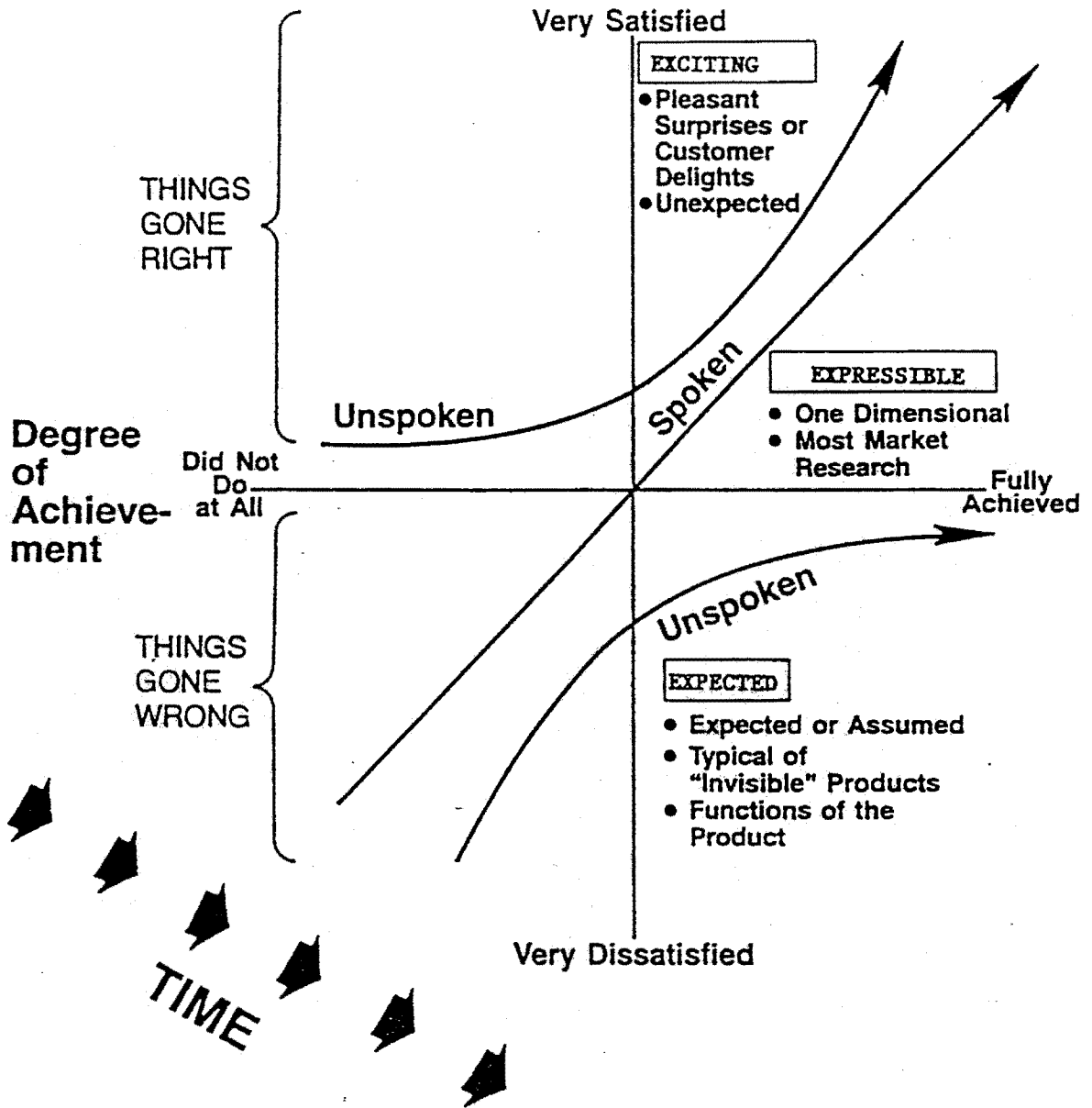
Ex: auto- massage seats for passengers.

Kano developed a model relating the needs of the customers to their degree of satisfaction. It is illustrated figure 1 [24].

## 2.3. The European attitude

James Lamprecht says [9]: "Product quality is a concern of every French plant I visited and customer satisfaction is the major management objective." This is also true for Rover which identifies its customers as being its 40,000 employees [13]. Therefore, Rover's main objective is the satisfaction of its workers. Mercedes, in order to reach its goal, earning money, feels the need to produce cars which fulfill customers' expectations. A. Koster [1] emphasizes the importance that the expected characteristics be compatible with the society, the environment, and not the least the price. As a result, one of the most important tasks of Mercedes' management is to be in control of the process involved in creating the product, its development planning and production.

# Customer Satisfaction



Adapted From the Kano Model

Figure 1. Three types of quality features.

#### 2.4. The American attitude

The first task is to collect the data from customers. Cadillac maintains 21 toll-free telephone numbers to enable customers to make complains or just plain offer comments [5]. It often appears that the customers' needs are not well translated or communicated to the design engineering department. Ford abolished the step by step approach which linked the customers' needs to the manufacturing process when it reengineered. Instead, the customer service representative position was created. He/she coordinates the whole process allowing the customer or the other departments to have *one* contact. This is important part of getting accurates, and it saves time [10]. The American companies develop surveys to find out what the customers want [21].

#### 2.5. Benchmarking

One effective way to satisfy the customers, by translating their needs into specifications, is benchmarking. A company needs to identify not only customer expectations, but also its target market and the competition. Then it can establish its benchmarks. All departments should be involved in the process at their level. The lack of benchmarking is mostly due to a lack of time or resources [23]. Benchmarking should be encouraged. It is not a matter of being able to afford benchmarking but a matter of being able to afford the lack of benchmarking.

### **SUPPLIER RELATIONSHIP**

#### 3.1. Why it is so important

The traditional way of selecting suppliers was to look at invoices. No emphasis was placed on quality, therefore the companies had to spend money testing product quality, returning defective

products, and wasting time while waiting for replacement products. The adoption of TQM philosophy is the result of three factors [20]:

1-A tendency of industry to move towards Just-In-Time (JIT) production.

2-A preference for purchasing components rather than producing them in-house.

3-A reduced percentage of labor to the total cost of a product.

So, the relationship with the supplier should be seen as a partnership instead of one of adversity and mistrust. Both supplier and customer should work together to establish quality standards.

### **3.2. The Japanese Model**

The Japanese have developed "business groups", or "keiretsu". These groups work closely with a small number of suppliers involved in the development of a product. These suppliers can therefore be considered real "business partners" [20]. In Toyota factories, these groups are an important part of the early goal setting process. The suppliers share "internal measures (e.g. customer-opinion results), improvement strategies, and long term objectives, including information about their new products and services." ([5], p129) The partnership is high enough in this example for the supplier to send Toyota products in advance for testing purposes. The resulting feedback allows the supplier to make improvements.

### **3.3. The European attitude**

European countries are very concerned by the supplier problem. The most relevant example is Rover's since the company used to have strong relationship with Honda. Robertson, Rover's CEO believes that by working more closely with suppliers, Rover will make better cars more cheaply and get new models out more quickly [15]. The company stopped using some of its suppliers who failed to meet delivery schedules, and *new* suppliers may be required to build production facilities close to Rover's factory in Longbridge, England [13]. According to Jack Semple [15], their relationships with

their new suppliers are based on trust. They installed the RG2000 philosophy, from Japan. The essence of this specification is that [15]: "Major component suppliers can be brought in at ground level, and make a contribution, based on trust, towards continuous improvement and driving down costs." RG2000 calls for partnership in research. Rover audits every aspect of a supplier's business, including its strategic management skills and "attitudes to employees and to the philosophy of total quality." However, the RG2000 measurements are often less precise than these supplier are used to. In judging attitudes, for example, Rover is interested in evidence of commitments for the future [15].

This behavior is not limited to Rover. A quality consultant in London says [19] "In the UK, there is a whole series of things called 'Euronorms', which have an EN number at the beginning...To be a significant supplier, a preferred supplier - or any supplier at all to many major companies - you will have to have." He adds "I think there is a genuine desire in Europe to improve standards." Mike Gallery, one of Rover's team leaders declares [15]: "This [the new kind of relationship with suppliers] doesn't just happen in the UK; this is very much a European issue. All car makers are moving in a similar direction, but Rover is probably ahead of its European rivals."

### 3.4. The American attitude

Ford set up the American Supplier Institute to train its suppliers on better and simpler ways to improve quality while reducing costs. At the same time, it develops the Q100 business specification [15]. Q100 lays out detailed agreements in terms of specific targets, pass and failure rates, against which suppliers can measure their performance. Like RG2000, it demands a complete open book relationship on costs and profits. The philosophical aspect of partnership and commitment to constant improvement doesn't unfortunately appear in Q100.

The Delco Moraine Company developed in 1991, an original way to resolve the quality problems they had with their suppliers. [4]. C. Birkholz, as General Supervisor of an assembly area, formed a

"supplier quality team". The employees were empowered to call the suppliers when a quality problem occurred. Soon after, they asked all their suppliers to meet the "suppliers quality team" and let them explain what they were trying to accomplish in terms of TQM improvement. This system faced a lot of resistance from upper management. Fortunately, the improved lead time and therefore, the money saved make management approve of the initiative.

### **3.5. Conclusion**

The Japanese model, with a true partnership between the supplier and the company has been imitated in the US and Europe. Following this example, companies have always reduced their products' lead time and cost.

## **THE CONCEPT OF EMPOWEREMENT**

### **4.1. Why it is so important**

The closer workers are to a problem, the better position they are in to make a decision. They must be given the opportunity to find and solve problems at their level. This empowerment will lead the employees to contribute individually by making suggestions.

### **4.2. The Japanese approach**

In Japan, empowerment is a natural attitude. People feel a responsibility for improvements. Irvin Otis notes [22]: "Quality is an obsession with Japanese workers." They perform their jobs while thinking of ways to improve them. For example ([6] p100), Nissan's management receives 19 suggestions per employee per year. Management seriously considers any suggestion that saves at least 0.6 second. To show the employees that their ideas are always valuable enough to be considered, Nissan policy is that within 72 hours, the supervisor must have a plan to act on the idea proposed,

and share that plan with the employee [6]. Honda also requires that its employees follow the "Honda idea creativity course". This course exists for three different levels (beginner, intermediate, and advanced). A contest is run yearly to determine the most creative employee [2].

The suggestion systems work really well in Japan. They are often inspired by the ideas of Masaaki Imai. In his book *Kaizen* (Continuous Improvement), the author outlines three stages a suggestion system should go through [6]:

1-Management helps workers provide suggestions that improve the workers' jobs and the work area.

2-Management stresses employee education so that workers can provide better suggestions.

3-Management focuses on the economic impact of the suggestions.

He also emphasizes the fact that if workers do not provide creative ideas, this is not a workers problem but a management problem.

#### 4.3. The American approach

The differences between the efficiency of the Japanese and the American systems can be illustrated by the number of suggestions per employee. According to S. George ([6] p100), US. companies average one-half suggestion per employee per year! The companies, aware of this gap make tremendous efforts to develop new suggestion systems.

Mr. Cadwell, chairman of the board of Ford Motor Company installed in 1984 an innovative approach to labor contracts. While describing in an *Automobile News* article how the employee involvement program must involve everyone, he said [16]: "We share our manufacturing cost data with the union, and we bring in labor when we look at a new manufacturing concept."

In the Delco Moraine company, the "Employee Involvement" is listed first among the ten elements of synchronous manufacturing. If

employee involvement is high, the other nine elements can be accomplished with "minimal disruption to the workforce". If involvement is not high, it will be a struggle for a small number of plant personnel (salaried or elected union officials) to make the change process a "go proposition." ([4] pp. 50-53)

The problem seems to be that nobody is willing to make suggestions. Even paying for suggestions has not helped. In the American automobile industry, ideas are lost because either the workers are afraid of making a suggestion, or the feedback is not valuable enough or does not exist.

The Cadillac Motor Car company's first objective towards TQM is to ([5] p 73) "Tap into our organization's brainpower and creativity. Get people to work solving problems." Cadillac illustrates its determination by calling its employees its "most significant advantage."

Despite all these efforts, the American automobile companies don't obtain as much involvement as they wish from their employees. But the improvement is on its way. The most important barrier is a lack of trust from management to the employees. The workers don't feel that any idea they give can be helpful for the company. Without trust, empowerment cannot be part of the company's policy.

#### 4.4. The European approach

In Europe, according to James Lamprecht's article [9], the main resistance for an empowerment program is a cultural issue. In France, the empowerment of employees seems difficult as managers don't want to lose control. Lamprecht goes as far as to write [9] "They [managers] even preferred to slow down or stop their organizations growth rather than risk losing control." It is traditional in France to see "Leadership from the front" which is described as "Tell me what to do and how you want it done, and I will do it" [9].

I had the opportunity to work for an automobile factory as an unskilled worker on the line. We were asked to try to identify and fix the problem when something went wrong. If it was beyond our



skills, we had to call the team supervisor (teams were composed of 7 to 10 workers) who tried to fix the problem. If he/she was unable to solve it, he/she called the technicians for technical problems, or the plant manager for "social" issues. In this company, the empowerment went down to the team supervisor, and to a certain extent, the employees. None of the employees would have felt comfortable making a decision such as calling the technicians to fix a machine. I did a survey at this time (summer 1990), and my conclusions were that people from the line (unskilled workers) didn't want any responsibility or to be involved in the decision making process. They were completely relying on the supervisor or on the union to defend their interests. The phrase, "paternalist management" is well adapted to the case of this factory.

In the Peugeot-Talbot factory in Coventry, England, they involve the line workers in the preparation of new cars. The workforce has followed a motivational training course [14]. Management admits being surprised by the results. Colin Walters, the manufacturing director declares [14]: "Now we have them sitting round the table looking at the new car with a level of commitment and intelligence which we didn't think was feasible in our blind ignorance." The Peugeot-Talbot factory is moving from a critical style of management to being positive and helpful. It is a difficult adjustment and will take time. It is noticeable that the employees are working harder than ever and that the atmosphere has never been better.

Rover attempted to gain their employees' commitment by constructing "zone circles" [13]. These are groups of employees with the same work interests meeting voluntarily on a regular basis. Their goal is to identify, analyze and solve work-related problems, to recommend solutions to management and, whenever possible, to implement the solutions. These circles worked well until financial problems forced the company to make the employees meet on their own time. The number of circles has been considerably reduced since then.

#### 4.5. Conclusion

The involvement of employees is far from being the same in Japan, the US, or Europe. American companies are in the process of empowering the workers, but they are not yet at the level of ultimate empowerment that the Japanese demonstrate. The European companies in general are far behind in the process of empowerment. They face a cultural, traditional problem. Therefore time is necessary for Europeans to modify their behavior. We can see some noticeable improvement in the industry and a lot of efforts are being made to educate the future generations of managers to adopt more delegating and empowering attitude within the schools and universities.

As C. Birkholz states [4] "Employee involvement is the easiest element to write about, but the hardest to attain." Building involvement is an enormous challenge which demands time.

### **5. THE MANAGEMENT OF PROCESS QUALITY: SPC, QFD, JIT**

#### 5.1. Definition

The **Statistical Process Control (SPC)** was developed in 1931 to visualize quality variations in production. It consists of plotting critical specification variables on samples. It has for an objective [20]: "the discovery of defects and the identification and removal of the cause(s) of defects or production variations."

The **Quality Function Deployment (QFD)** is a system that pays special attention to what the customer wants, called "subjective quality" by Gilmore [8]. These needs are prioritized and translated into measurable marketing, design, manufacturing, and service process requirements, called "objective quality" [8].

The **Just-In-Time (JIT)** approach leads to manufacturing products only when the order has been established. This leads to suppliers delivering when the factory needs its materials. To satisfy

the customer, the company must work on reducing manufacturing time.

## 5.2. The use of SPC

SPC is considered, "a basis for making judgments" ([3] p 34) by the Japanese companies. They have successfully used this tool since the 1950's [11]. All the workers are trained to plot the data and analyze the charts. They can therefore immediately identify an anomaly.

The French published research papers on SPC as early as the 1930's. Unfortunately, manufactures ignored the concepts for 55 years. Following the German example, they now use this tool. Unlike Japan, in Europe the workers are expected to do all the quality checks and SPC recording and even to do SPC investigation [13].

American companies are beginning to follow the concept with Ford and General Motors as leaders. Unfortunately, as in Europe, most of the advocates of SPC, "do not thoroughly understand what they really do. Generally, it is considered a production tool. Actually, its greatest impact is on the factory's social organization." [11]

## 5.3. The use of QFD

The QFD theory, developed by Yoki Akao, was applied at Mitsubishi Heavy Industries in 1972. QFD is considered the recommended Japanese technique for new product innovation and introduction. [8]

In 1982-1983, QFD began to be developed in the European and American automobile industries. [8] Mercedes and Cadillac successfully use this method with matrix charts[1]. The CEO of Cadillac's comments on the method are ([6] p 112), "It's like auto makers watching people in a supermarket parking lot. They [the design engineers] want to see how a car's trunk is used in real life, if it opens the right way, if it holds enough, how it could be improved." In fact, they are listening to the external and internal voices of the customers.

#### 5.4. The use of JIT approach

The Japanese have used this method efficiently for many years. Many carmakers are reengineering their total delivery system to reduce the lead time. The Japanese objective is to be able to build a car to customer specification, and deliver it, within two weeks after a dealer receives an order [19].

In France, the concept is beginning to be adopted. Unfortunately, the concept is not understood and the application of JIT production often leads to an increase in the plants' surface area [9]. In the States, the concept is not understood any better. The companies tried to adopt the concept without changing the step by step way the factory is run. Therefore, the installation of JIT production has led to turbulence [11]. The JIT tool is still considered powerful, but companies should understand fully the concept, and prepare the production process to welcome it.

### **6. THE ADAPTATION OF THE ACCOUNTING SYSTEM**

#### 6.1. Introduction

Japanese companies don't have cost accounting systems like European and American companies have. The European and American traditional cost accounting system is labor oriented. As automation is more and more present in the automobile industry, the information given by the system less and less accurate. It can measure only the costs of producing. "It ignores the costs of non-producing." [11]. This leads to an incorrent basis for pricing products and making decisions.

The Activity Based Cost system (ABC) has been developed to allow the companies to know their exact costs. Another model, "manufacturing accounting", [11] aims at quantifying the impact of manufacturing changes on the total business and the business impact on the measurement of factory performance.

## **6.2. The Japanese system**

Irvin Otis [22], notices that the Japanese final assembly area relies heavily on manual labor. The Japanese find that the workers can be inspecting quality while they work. The change in the proportion of manual labor compared to machine labor is not as huge as in Europe or in US. Moreover they don't price their product according to cost because they do not collect the needed data.

## **6.3. The European adaptation**

Europeans have been the first to adapt their cost accounting systems to their companies' needs. In order to estimate the cost of poor quality, Mercedes-Benz [1] turned all its plants into cost and profit centers. This allows the company, "to capture the relatively dramatic costs of errors in absolute figures." Management can then take preventive measures to reduce these costs. The results of the quality cost investigations and audits serve as a basis for improvement measures.

## **6.4. The American adaptation**

American companies took more time to revise their cost accounting systems. In order to find the activities relevant for their company, Ford analyzed some of their main operations. This analysis led them to re-engineer the accounts payable process [10]. Ford simplified their processes and therefore tightened the department. But, as Michael Hammer writes [10]: "Ford was enthusiastic about its plan to tighten the accounts payable-until it looked at Mazda. While Ford was aspiring to a 400 person department, Mazda's accounts payable organization consisted of a total of 5 people." This kind of behavior can be observed in many other companies. This is the influence of the unwritten quality principle, the so-called ([5] p 80) "KISS Rule" standing for "Keep It Simple, Stupid." This concept comes from the experience that the simpler a process is, the faster, cheaper,

and less error-prone it tends to be. Unfortunately, even if the processes are simple, the ABC accounting system is always very complicated and requires time and efforts to be set up.

## **7. CONCLUSION**

Automobile industries are very interested in TQM philosophy. The Japanese committed first. Their good results in terms of flexibility of the production, cost of production, and satisfaction of both employees and customers made European and American industry follow the principles of the quality gurus. Their concept, however, is not totally adapted to the companies. Ford's management even if it is the most loyal corporate disciple of quality messiah, W. Deming, doesn't agree on all his recommendations. Gill, the executive director of Ford Corporate Quality says, [12] "Dr. Deming does not believe in setting goals, but we like to, and believe you also have to reward individuals for achieving them." Targeting goals is an important phase at the beginning of the implementation of TQM philosophy. Tracy Benson questions [17], "Instead of focusing on the finished look, by buying the entire wardrobe right off the bat, what if companies focused on continuous improvement by targeting areas of the closet that will produce immediate returns?" It is essential to gain commitment to TQM.

In general, TQM implementation finds traditional and/or cultural resistance. Europe and the US need time to implement the full concept. Moreover, the understanding of the ideas is essential to the successful implementation.

TQM is a philosophy which can lead to great cut in costs and appreciable improvement of quality. Its implementation requires total comprehension, and commitment, to the concept. Europe and the US are still working on it.

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